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## THE USE OF PHYSICAL ENERGIES IN THE TREATMENT OF TUBERCULAR PERITONITIS\*

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There are in medicine two great plagues, the Black plague and the White plague. Today we are interested in the study of one phase of the white plague, viz. tubercular peritonitis.

As early as 1900 a paper published in Virchow's Archives, maintained that no less than 99% of those who had attained the age of 30 years, showed evidence of tubercular infection at some one or more points in their anatomy on post mortem examination.

So great was the loss of life, and the monetary loss that many years ago, municipalities, states, and even nations, began the mighty effort of controlling this dreaded disease. Today all are familiar with the care with which our milk supplies are watched, our dairy cattle guarded not only by the cities furnished with the milk from various herds, but even the government is spending millions in selecting herds, and placing them under governmental control. Federal accredited as they are pleased to term those so inspected and so carefully guarded against this disease for fear of its dissemination.

States are building and maintaining large hospitals for the care of these unfortunates, and every effort is being made along the lines of public education to help or limit, and control the disease.

Medicine and surgery in all its branches has made a supreme effort to lower the mortality and morbidity of the many phases of this terrible scourge. I therefore offer no better excuse for presenting this subject to your attention at this time, than to remind you that while life eternal is believed to exist in another world, the eternal question in this life is the prolongation of man's little span of years. I can not offer you an elixir, that was sought in Bulwer's "A Strange Story", upon which you can tank yourselves up and live healthy ever afterwards, and know the world down through centuries, but I bring you a message of simplicity that it is believed will aid you in lending the helping hand to some of those suffering with this common affliction.

Before going further into the study of this condition it is well to understand that primary tubercular involvement of the peritoneum is conceded to be rare, and only since 1884 have

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we had even a fair understanding of this condition as a whole.

The cause is of course the infection by the tubercular bacilli. We are then confronted with the problem of its entrance to this sealed cavity, except in the female where the fallopian tubes offer an entrance from the outside world. About 10% of all cases suffering from tuberculosis of other organs show peritoneal involvement. Konig's statistics as to the frequency shows the lungs involved in 92%, the gut in 4%, the kidneys and spleen in 35%, the suprarenals and liver in 5% each, the tubes and adnexa in 40%.

There can be no doubt that various communities would show vastly different percentages of peritoneal tuberculosis, depending on the frequency of the disease in other and all parts of the human anatomy.

The delicate structure of the peritoneum offers a fertile soil for the implantation of most any variety of infection, and especially one that is so frequently found in our anatomy.

It may be said that three routes are available for the spread of this disease from any point to the peritoneum, viz: Hematogenous, as where the primary foci is traumatized as in an attempt at removal of glands surgically. Again if primary peritoneal tuberculosis is assumed they must reach the membrane by the blood stream.

Second by contiguity, the lymph stream acting as the medium of transportation. Again contiguous structures may be involved without any intervention of healthy tissue. Last by continuity of tissue we have the spread of the condition from one structure to another, and in this manner we get the peritoneum involved from the portion of the fallopian tube that is primarily invaded or the gut wall may also

be the starting point, and later the entire peritoneum covered by the infection. It is most often difficult owing to the advanced pathology present at post mortem to say just where the primary lesion was located.

For the purpose of study many types of the disease have been described, but from a pathological view point all are the same differing only in extent and in small details. While the many varieties are interesting from a certain point of view, to the surgeon interested in abdominal work, two classifications were all that he needed, so far as practicability was concerned to arrive at a conclusion as to whether or not he would invade this area. Complications of these types also offered a reason for serious thought looking toward surgical intervention.

For many years it has been known that surgical intervention of the so called dry, or plastic type of peritonitis not only did no good so far as cure was concerned (unless done for the relief of adhesions causing obstruction) but in many did actual harm. While in the serous type where dropsy was present we were not only justified in going in, but surgery was advocated by every modern surgeon.

It was a question as to how this good was brought about, whether it was the sunlight that was allowed to get in for the few minutes the cavity was opened, or whether it was the entrance of air that caused the cessation of activities, or if drugs were used in the cavity such as iodoform as was at one time used we naturally thought, the use of the chemical agent played the major part in the relief. Of course in those cases where the major portion of the pathology, it being the primary foci was removed we ascribed the benefits to that plus the entrance of air.

At best we were practicing empirical medicine, with not the slightest idea as to how we hoped to benefit these cases, only knowing

clinically that some did get marked relief following the operation.

There are something like twenty possible ways by which operations helped to cure these poor unfortunates, none of which were ever proven, a thing in itself casting some doubt on the seemingly beneficial effects of the work. Those theories having the staunchest support, were that an active and passive hyperaemia were produced in the cavity by the handling of the viscera, the irritation of air, heat and light.

Pathologically it seems most reasonable to think of the good done by the reaction brought about by the operation, viz. increase in leucocytosis and phagocytosis. These the after results of the irritation caused by the handling of the cavity and its contents. Again the relief of intra abdominal pressure may play an important part. Operation under our present day trend of thought may have had its greatest influence on the sympathetic nervous system and in that way influenced the entire human economy. To fully understand the action of the sympathetic system, which by the excessive stimulation it gets from the reflex action and the emotional states, explains, the sweating and the loss of appetite, rapid heart etc., we must go back to embryology where among other information we learn that the cells early in embryonal life float, so to speak, from the central nervous system, and never come to complete rest until lodged in the walls of the viscera. Also that the glandular system as well as skin come from ectoderm therefore of common origin and closely associated as to nervous influences etc. The writer wishes to commend to you the more careful study of the sympathetic system as one of the most instructive and fascinating studies open to your perusal.

A study of this great system will explain much of what is to be said in the following remarks relative to the use of physical energies

in the relief of the disease. We are just now beginning to realize how much the sympathetic system has to do with our very existence, for it is this that controls our lives from the earliest existence down to the last hours when cellular activity ceases and life is no more.

Before going further into the whole question of causes and treatment it is necessary for us to have some logical reasons for suspecting a case to have tubercular infection of the part of the anatomy under consideration. How are we to know or to at least suspect these cases? My own observation being that in most cases of what ever ailment, diagnosis is the one essential thing. Only too often are we floundering around with poorly correlated symptoms, and just really don't know what the patient has.

The writer has endeavored to watch these cases and to obtain as near as possible the symptoms earliest complained of that the condition might be suspected while treatment offered most. The onset of abdominal symptoms is usually preceded by gradually failing health, and irregular temperature, with a localized or general abdominal tenderness, which is increased on walking or jarring, and the extent of which depends on whether we are having to do with a localized form as in the tubes or appendix, or whether it is more or less general.

If the tubes are the primary foci, we will in all likelihood diagnose salpingitis of low grade and operate for that, and when the abdomen is opened the true condition is found.

So also when located around the appendix, operation for appendicitis usually reveals the true nature of the disease. In the more diffuse types, little is present to confirm our suspicion until ascites being developed, and especially when the fluid is removed and its character studied, in every way do we many times first realize that we are dealing with such a serious study.

One of the factors to first consider in the case history is the age. While no age limit can be set, it is definitely known that tubercular involvement of this structure is more often seen between the ages of 20 and 40. Many children however, have peritoneal tuberculosis and should be considered closely when coming for an obscure tender and painful abdomen that is not significant of acute or sub-acute appendix the one thing first to think of.

Again sex must be considered for women are twice as often afflicted as men. This difference however may be accounted for in the fact that more women have their abdomens opened than men, hence the greater number of cases found.

Temperature is not a sign of great value. Osler many years ago called attention to the danger of calling tubercular peritonitis typhoid fever and so treating it, until time proved otherwise. Of course today Widal test would help to obviate this error. The more chronic the condition the lower the temperature, so also do those having well walled off pathology have little or no pyrexia.

Digestive disturbances are of vast importance in the anamnesis. We have hitherto called attention to the influence exerted on the sympathetic nervous system by the toxæmia etc. and will have occasion to again refer to this great system when speaking of the treatment. One of the first symptoms the patient calls attention to, is their inability to eat and digest the usual variety of foods taken. Loss of appetite, indigestion, so called dyspeptics, of former years when that term was in vogue, whatever it might have meant.

Intestinal discharges may be too frequent or may be too infrequent. This will depend entirely on whether or not the intestinal mucosa is involved in the process.

When once the inside of the gut is involved, irritation naturally causes frequent

bowel discharges, with one exception, that being where adhesions interfere with the peristalsis and slow the fecal stream to below the number in health which Alvarez has fixed from four to six per minute.

In studying the female, menstrual disorders means very little, as it may be amenorrhœa, dysmenorrhœa, or metrorrhagia.

Inspection is of importance, as the skin may at once be noticed to be excessively pigmented, meaning that the adrenals may be pressed upon, if not involved. If a discharge is coming from the umbilicus and is purulent and is of rather long standing it means that the condition underlying is tubercular. Again if ascites is present to any great amount, the venous enlargement over the abdomen suggests the possible cause. The general contour of the abdomen is also to be considered as the shape of this portion of the body often leads to the trouble inside.

Palpation will elicit in the child a crying out, not when the abdomen is compressed, but when the pressure is suddenly released, allowing the wall to distend. Many times the thickness of the wall can be easily determined by careful palpation, a thing that should always be done with warm hands, to avoid the muscle spasm from the cold.

Percussion only helps to differentiate between ascites and tympanitis, and rectal examination, if the male or vaginal in the female, only serves to confirm the amount of pelvic involvement, and not the type. Localization of other foci in the body, or tubercular diathesis aids materially. In this connection comes the incalculable value of the x ray. Even where no pulmonary lesion is found, in many the costal cartilages will appear moth eaten so to speak, or entirely gone, a condition calling attention at once to the fact that nature has removed all or part of the calcium from these

structures, it being more easily pulled from cartilages than from bones where it is well fixed. This thought is very valuable in the management that is to follow. Where such pathology is found it always suggests strongly a tubercular tendency at least. Skin tests are only of minor importance in arriving at conclusions.

Once the condition is diagnosed, the great problem confronting us is what to do. In many, surgery will be ruled out with a passing thought, while in others it must be given serious consideration, if not at first, at least some time during the management of the case. Diet and medication are familiar to all, and only needs to be mentioned and dismissed.

For years tubercular cases were divided into those that were surgical, and those that were nonsurgical. Today when we come to treatment it seems proper that they should now be divided into pulmonary and extra-pulmonary. The commendable work of Rollier with his great number of cases should be sufficient to convince the most skeptical that sun light is our most potent agent with which to fight this monster.

When Koch discovered the bacillus, causing this disease he soon discovered also that a very short exposure to the rays of the sun killed the germ. This is but in keeping with most all examples of life in constant observation. So numerous are the influences of light on both plant and animal life that volumes could be written by both the poets and prose writers and yet the half would not be told. *Mast on Light and the Behavior of Organisms*, should be read by every physician.

The handy work of the all wise Creator when he said in the third act of the creation, "Let there be light and there was light" is best told in the words of Gilder in the "New Day",

"Against the darkness outer  
God's light his darkness makes  
And he from the mighty doubter  
The great believer makes"

From the least to the greatest of the creations, all feel the mighty influences of natural forces in life. Time will not permit the references, but a study of our own body chemistry will aid much in this connection. That at least two diseases thrive in darkness is well proven, viz; rickets and tuberculosis. The first of these to attract attention was tuberculosis. Several years have passed since cities began having building laws, regulations as to how much space shall be between each house located on a given area. This was done that occupants might have at least one thing along with the rent that they did not have to pay for, that being sunshine.

Physical energies do not cure tuberculosis in any form per se, but since the disease tends to recovery in any structure if given a chance, and since it is impossible to reach the germs with the ultra violet rays, what we really do is to raise the general body resistance, by balancing the endocrine system by the stimulating effect of the energies on the sympathetic nerves.

Zoologists agree that all function is dependent on nerve impulses, and so long as such impulses are normally generated, and normally conveyed to and from the end organs of nerve fibers, will proper function continue. While we have known for years that the skin was a receptor for heat, cold, touch and pain, not until recently did we know that it also contained a receptor for the ultra violet energy. This fact, "and a fact it is," is not so wonderful, as we have known for years that the retina of the eye held a receptor for a visual color, viz purple. Any receptor is merely a receiving station specially tuned in, to certain wave lengths that are constantly broadcast from the sun.

We know that ultra violet penetrates very slightly into the depths of the skin, and what at first seemed its limitation, now is proven to be its special feature. All the ultra violet is absorbed that is not reflected off, and by its stimulation on the sympathetic system it changes the membrane tension of the cell wall, and permits the calcium to enter, in exchange for the more diffusible potassium ions, which at the same time leaves the cell. If the parasympathetic was stimulated the opposite would take place. (Light and Health by Pacini and Luckiesh). By the ultra violet we raise the calcium and phosphorus level by favoring the handling by the cells of such chemicals as they are in need of at that time to maintain the normal body resistance.

Industrial plants observed some time ago that about 75% of shipping mistakes as well as accidents occurred during the months when there was least sunshine, therefore little ultra violet, and they have arranged to supplant this by artificial sunshine from lamps. A very strong argument toward the body uplift by this agent.

If there is any one thing that ultra violet seemingly cures it is tubercular peritonitis. Many of these unfortunates that were formerly regarded as incurables are now relieved by this physical agent. Those cases do best that tan, or pigment, sunburn less the erythema. By the skin thus becoming discolored, they are able to stand much more of the exposure than those where tanning does not take place. It being a law that longer exposures are far more beneficial than shorter ones, even if frequently repeated.

The technique in using the ultra violet is to begin with the thyroid type or blonde, at two minutes, or brunettes at three minutes, the first exposure anterior and the same time posterior, and increase one minute each day until sixteen minutes is reached then allow an

interval of sixteen days to lapse and start over again. This to be repeated for four times beginning at minimum doses each time, and all treatments given in a darkened room and on black covered table. In the adrenal type we are safe in starting at three minutes and increase as in the former. Along with the use of the lamp we should use the minute doses of thyroid ext. and calcium for the reasons mentioned earlier in the paper.

Again the use of the x ray is a valuable adjunct in these cases. This lesson has been taught us in tubercular effections of the lungs. The best method is perhaps to use three to five Ma., 120 K. V.'s, with three to four millimeters aluminum for a filter, at sixteen inches distance and treat for ten minutes, the exposure being anterior. This to be repeated on the third or fourth day. Six to ten treatments is about what should be given then a period of rest for sixty to ninety days.

Another physical agent to be used along with the above is water. Nothing I have ever used in my practice has yielded better results than the cold sponges and the cold chest pack, in those below par and whose general body resistance needs raising to the normal. Begin with the water at eighty degrees Fahrenheit and reduce five degrees each day to fifty-five and use at that temperature each day thereafter, using the sponge and the bath at the same temperature on the same day.

The cold sponge for fifteen minutes, followed by the brisk rubbing with the crash towel until the skin is aglow, brings bouancy and general good feeling and stimulates the patient by toning up the nervous system as medicine will not do.

In using the chest pack one should have the patient get enough heavy linen to make a sleeveless, and collarless jacket long enough to reach to the crest of the hips, this to be

of one thickness. And front large enough to overlap from side to side. Also enough flannel-ette to make a two thickness jacket with short sleeves and a collar and tail six to eight inches longer than the linen and front as described for linen. Have patient dip the linen jacket in the water at the proper temperature for that day. Wring out the excess and spread this jacket on the outer one of flannelette, then slip these on the patient quickly, and with as much rapidity as possible turn in the sleeves, collar, and tail to exclude the air, and bring the front well over to the sides so as to have an overlapping. When the air is excluded the patient is perfectly comfortable and in most instances will obtain from one to two hours sleep, during which time the jacket remains on. When they arouse it can be removed and the body again briskly rubbed with the crash towel and such garments put on as the patient is accustomed to wearing during the day whether it be gown, while in bed or ordinary clothes if allowed up and about the house.

A trial will convince the most skeptical as to the effects had from this procedure.

#### DISCUSSION

GUSTAVUS M. BLECH OF CHICAGO, ILL.: In the consideration of tuberculous peritonitis it is essential to appreciate that this disease is very seldom if ever primary in character, but secondary to tuberculosis of a viscous or organ of the abdominal cavity. This, as well as the particular form one has to deal with, must be determined by thorough physical examination, though it is not always easy to do, for the forms not infrequently cannot be differentiated, there being a certain amount of characteristics of either form in one and the same case.

Symptomatically, too, we are often misled. I have seen a soldier die from tuberculous peritonitis of the adhesive type ten days after arrival in a camp of instruction, where he worked up to admission to the camp hospital, a few days prior to his death. This one example is cited merely to show the insidiousness of the disease which very often leads to an improper diagnosis at a time when a correct diagnosis would have been fruitful.

Fortunately tuberculous peritonitis, in my experience at least, is not frequently seen, at least not during the past ten or fifteen years, so that Dr. Willmuth must be congratulated on his good luck in having seen a very rich clinical material.

As regards therapy the classification into dry or adhesive and into the exudative form is of importance to the surgeon, because we know that laparotomy in the former is almost always useless while in the latter form some cures have been obtained by mere exposure of the abdominal cavity, removal of the liquid contents and disturbing only the most important adhesions.

Why laparotomy with or without iodoform treatment produces a cure I do not know, because according to our present state of knowledge the very liquid which we remove is supposed to contain healing antigens. Certainly the theory that the mere admission of daylight into the peritoneal cavity does the trick is unworthy of serious consideration.

I think that laparotomy is often followed by cures not by the laparotomy per se as much as by the appropriate after care which is afforded the patients, for no competent surgeon will fail to prescribe some form of treatment known to have a favorable effect on this trouble.

We have used the fresh air treatment, we have used light, roentgen rays, green soap inunctions, certain baths and what not, and one naturally cannot tell with a limited material which of the agents used has a curative influence or most of it.

We must fall back therefore on the statistics, of the literature and in this particular I mention Dr. Bernhard's great work who has had nearly one hundred per cent of cures in his sanatorium at St. Morris, Switzerland. Of course we have no means of following his technique of allowing patients in the nude to be exposed to the Alpine sun and climate summer and winter, but we can substitute that to a certain extent and, possibly, obtain satisfactory results.

I am sure that Dr. Willmuth in his very interesting and instructive paper shows the way, but I must emphasize that after all an early recognition of the disease is of prime importance—moribund patients cannot be cured and miracles cannot be expected from any form of therapy.

DR. E. W. KIME (INDIANAPOLIS): I want to take just a minute to give you four actual case reports of tuberculous peritonitis approached by laparotomy.

No. 1. A case sent by Dr. Willery had been operated. Diagnosis undoubted. Dr. Willery treated the patient with the air-cooled lamp. The patient moved to my town. I completed the treatment. It has now been over a year and a half. The patient is apparently well but still gets systematic radiation.

No. 2. A woman operated upon by the same surgeon, histological section positive for tuberculosis. This woman had been operated upon three times within the preceding year for tuberculous adhesions. This woman has been under my observation for almost two years. She has received diathermy, plus systemic ultra violet radiations. She has gained in weight and strength; the bowel function has become normal since we started treatment.

Another woman operated upon at the university hospital, histological section positive, has been seen only recently. She is in the outpatient department; she has been there six months and apparently is doing well.

Finally, a man of forty years of age who had been operated upon twice for tuberculous peritonitis with adhesions and with the usual fairly satisfactory after-result, developed an exacerbation of the original condition, ascites, that doughy, peculiar feel that is characteristic of tuberculous peritonitis. He had an enteritis of such severity that he was having from twenty to twenty-five bloody stools a day. He was referred

to me by a gastro-enterologist who had given him a good deal of air-cooled ultra violet radiation. This patient, despite this treatment, developed the enteritis. It was necessary to hospitalize him and of course we used all the usual medication to control diarrhea. We did not begin to get results, however, from our medication until we began to use diathermy in addition to our ultra violet light.

This man did not improve immediately but he was in such desperate condition that we did not feel we were justified in opening him even under a local anesthetic, but persisted with daily applications of diathermy and mild systemic ultra violet radiation, plus the medication by mouth which had been unsuccessful before, his diarrhea ceased and the last time I saw him, he had gained twelve pounds in weight, was having normal stools, and was apparently on his way to complete recovery. What turned the trick I don't know, but the fact remains that diathermy, an agency which is supposed to be contra-indicated in hemorrhage, did not make this man's hemorrhage from the bowel worse. Medication, which is ordinarily helpful in diarrhea of itself was of no avail, but the combination of agencies did the work.

DR. WILLMOTH: I haven't a word in closing because the hour is late. I just want to thank the gentlemen for their discussion of this subject and thank you for your attention.

## STATIC ELECTRICITY\*

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Static electricity is the oldest form of electricity used in medicine. Stewart in his book on physical therapy says that galvanism is, but I think this statement will be corrected in the next edition.

Static electricity was first described in a book published in 1650. It wasn't until 1800 that galvanism was discovered. I have in my office a book published in 1743 describing the uses of static electricity in treating patients and illustrated with a very nice two-plate machine, Leyden jars and patients getting sparks from the condenser discharge of the Leyden jars. That was illustrated in the book away back before galvanism was discovered. So it is the oldest form of electricity we use, although we might say when the Greeks used the electric eels they ante-dated that. They didn't know what was in the eels. They knew when they threw a patient into the pool with the eels he didn't like it. It was electricity he got, but they didn't know it then.

Static electricity, as Dr. Elsom has said, used to be much more employed than now. There was a wave of enthusiasm, probably due to the historical side of the static, with the viewpoint it was a good thing to use. Many years ago a good many more doctors had static machines than have them now. Then the enthusiasm for static dropped out to some extent. It is peculiar that it never entirely went out of use.

Faradic electricity now is practically out of use entirely. Static electricity has never gone out with the different phases of ther-

apeutic enthusiasm that have gone through medicine; static has always held some place and a few people have worked on it to find out what it really was and what it really could do. Now that we are doing electrotherapy on an important scientific basis and understand more of what we are doing and the reactions that electricity of different forms will induce in different individuals, we see that static electricity has a peculiar place which can not be taken by any other kind of current.

There is no machine that will generate static current except a static machine. There is no machine that will generate a current that will do what static will do except a static machine. You must have the rotating plates and friction. You probably have all seen static machines and you know what their construction is. I might go over it with you.

There are three kinds of machines. The first one was the Toppler-Holtz machine which was self-charging and had stationary circular plates and revolving circular plates. That machine started, generates its own current, and probably due to the fact that the machine held a current in there, the current is called the static current. Correctly speaking, electricity can not be static because it can not remain at rest. If it is at rest, it isn't electricity because electricity is energy in motion. On account of the machine's holding the electricity, they named it static electricity.

The other machine which is self-charging is the Wimshurst machine. The Wimshurst model has two or more circular revolving plates which revolve in opposite directions. There is direct contact between them and brass brush-

\*An extemporaneous talk given before the American College of Physical Therapy in Chicago, Oct. 21, 1926.

es, so that you can get direct friction. The disadvantage in the use of these two models in treatment is, that every time you start the machine you have to test your polarity, because static electricity is an undirectional high voltage current and polarity has everything to do with treatment. One pole can be very sedative and the other pole very irritative. The machines used today are of the Holtz model where the stationary plates are fixed across the machine above and below the axis of the revolving circular plates. The Holtz machine is not self-charging and if it loses its charge, it must be charged by some other means. Consequently, in the machine, an example of which you can see in the Exhibition Hall, there is a Wimshurst machine on the side so you can make a charge and throw it over into the big machine, and in that way use your big machine which will keep its polarity and use that as long as that charge is in without worrying about which is the positive and which is the negative pole.

Static electricity, as I said, is a high voltage current and that is the great advantage of it. When you take one of the big, modern machines and run it at full speed, it is estimated you can get close to 1,000,000 volts out of it. When you have the spark gap closed and the machine is generating 1,000,000 volts, the most amperage you can get is about four milliamperes—not amperes, but milliamperes! If the spark gap is open a meter would show only half or three-quarters of one millampere, still the voltage would be about a million. Very frequently in talking electricity to people, especially medical students, I like to draw the comparison between electricity in wires and water in a system of tubes. If you realize your voltage is your pressure and your milliamperage is your volume, you will see that here we have in static, a current of very, very high pressure, but of no volume. It is like a stream of water with a very high pressure coming out of a fountain pen filler.

It is a wonderful decongestor to push out infiltration from the tissues. It will never do harm, and I have seen some of the men fool around the machines and take an eight or ten-inch spark on their hands and not show they feel it. I promise you if you make a mistake and the machine is well charged and you get an eight or ten-inch spark, you won't like it. It will feel as if somebody hid a mule behind the machine and the mule got you. It never does damage. They have held guinea pigs and rabbits in the spark between the two rods of the machine and let the spark go through their heads and dropped them down and they ran right off.

There has never been any fatality that I ever heard of happen with static.

I have spoken about the apparatus; as I said, there is the positive and negative pole and you must know how to test for the positive and negative pole and you must know what you are giving. I know of a doctor treating a patient for a painful back. I have forgotten what the trouble was. He had a Toppler-Holtz machine which can change polarity. The telephone rang and he couldn't hear on the telephone, so he stopped the machine. When he came back to treat, unknown to him, the polarity had reversed and the patient almost went off the chair. You must know your polarity because, as in galvanism, the positive is for pain and the negative is the irritating pole.

There are only three modalities in static electricity we use today. There are other variations and everybody gets up all sorts of fancy modifications of the fundamental ways of using it. We have the static wave current which is frequently called the Morton wave, because it was discovered by Dr. William Morton many years ago in New York and described by him. We have the static sparks and the static brush discharge or effluve. Those are the three things we use. On patients where we want to decongest or drive out infiltration. I can tell you

frankly, when I started to do it, I did not fully realize that.

When I saw cases of tenosynovitis with plenty of fluid in the tendon sheath and saw the fluid go away in front of my eyes, I thought one of the miracles of medicine was being performed and I was just a lucky witness. You can absolutely move fluid out of any part; you can decongest whenever you want to, especially after using light or diathermy. The use of static is particularly beneficial when you have induced a physiological congestion or hyperemia, in the part, using the extra blood there to wash out the part and forcing it out with the static, to get rid of the congestion in the part you have induced by your thermal agent.

The static wave current is applied to the patient by using Crooks metal electrodes and with such high voltage as static is you do not have to be particular about having good contact. You don't have to worry as you do in diathermy, because you can hold it an inch or so away from the patient and the current will jump to the patient anyway. You put the plate over the part you want to decongest and connect that plate with the positive pole. The patient is seated on the platform, which we have all seen with static machines, insulated from the earth by glass. The negative pole is grounded and the patient is made into a Leyden jar. Your patient is charged and discharged and really becomes a condenser in the circuit, being attached only to one pole. The mechanical action of the current going in and out of the patient does the work.

There is no definite electrical reaction to static current. Undoubtedly there is some when you put electricity into the body, but the volume or milliampereage is so small you can't expect much electrical effect. You get the mechanical action of the current going in and out of a condenser and your patient is just a "Leyden jar." He is just the same as the Leyden jars

on the machine, they are condensers; the patient is a part of the system of condensers.

When you have, for instance, a myositis and you have warmed up that muscle and brought more blood there, either with radiant light or diathermy and you want to wash out the pathological and physiological congestion in that muscle, the action of static electricity is just the same as if you were washing a sponge out in a pail of water. You have your fresh water, which is the same as the blood, you have brought there with the heat and you squeeze and relax the sponge and wash it out. The same thing happens with the Morton wave current when you use the static current to wash out infiltration in the muscle.

I think one of the reasons static lost its popularity was because some of the results were so astounding and miraculous that people became over-enthusiasts and thought they could do everything with static electricity and consequently worked against the advancement of static rather than working for it. It is miraculous to see how infiltration in sore muscles, for instance, is cleared up. I have treated football players with "charleyhorse" or myositis in the thigh from direct injury and it was nothing at all in two or three treatments to have them back playing football again. Other myositis cases, lumbar myositis or trapezius myositis, are really very simple to treat when you use the static wave current.

We generally follow the static wave current with static sparks. The patient is then connected to the positive pole, or rather the platform is; the negative pole is grounded and from another ground you take the "infamous", as *they* call it, ball electrode, the brass electrode with the ball on the end, approach it to the patient and ground the current in the condenser or patient. You merely discharge the condenser to the earth; that is what you do. In that way you get a violent contraction which is some-

what painful, but it is very much appreciated by the patient, and although a patient will kick about the first three or four sparks, before you finish the treatment he will say, "Give me three or four more on that spot there." Patients will ask for more sparks. It is a wonderful pain reliever and that really finishes up and completes your static treatment.

Sampson claims that you should have the patient connected with the negative pole and ground the positive and give the current to the patient, because we can prove in static electricity that the current does run from positive to negative. (That can be proven, and you always see that in the use of the static brush discharge.) Personally I do not agree with Sampson that the patient should be connected with the negative, because I feel that when you take the current from the patient, for instance from the shoulder, you take it from the whole body and pull it out at one point as a spark and you get a broader action of your static spark than if you have the patient connected with the negative when you give the current to the patient so that it hits the shoulder and spreads after it goes in. I think you get a greater contraction and it is not as painful when the patient is connected with the positive. The usual procedure is to connect the patient with the positive.

The other modality we use is the static effluvium, sometimes called the brush discharge. Here the patient is connected directly with the negative pole; the positive pole is grounded. That is a reverse from the other hook-ups because you want to give the current to the patient. Your machine runs then at very high speed and a ground chain is brought to the end of the applicator used for brush discharge. There are all kinds of them. Some people use brass whisk brooms, some use ordinary whisk brooms. Dr. Holliday of Los Angeles believes in using a broom handle soaked in water so it will carry current. Dr. Kraft of New York has got-

ten up to famous "blue pencil brush discharge applicator", which is a cylinder of fibroid filled with asbestos so as to break up the current in there and offer resistance. There are many modifications of the static brush discharge.

The point is to give the patient electricity of a very, very high voltage. You have the machine running much faster than they could stand otherwise. The patient being connected with the negative, you bring the applicator towards the patient and you get an effluvium out of it which is a marvelous sedative and a wonderful decongestant.

Another thing to remember is this: being an electrical arc, you generate ultraviolet light. Any electrical arc generates ultraviolet. Two ordinary bolts with current in them, brought together to arc will generate ultraviolet. A lot of the beneficial effects of brush discharge in chronic infections, ulcers, especially the varicose ulcers and herpes zoster are partially due to the ultraviolet light, I am sure. At any rate you have a very smooth sedative current that feels like a breeze, or if it is a humid day, because it is going through the moist air, you get a little sort of tingling sensation like hot sand.

The brush discharge and the wave current both must be administered on the bare skin. The current will go right through anything but when stopped forms sparks. If you make a mistake and connect your patient with the positive pole, ground the negative and then have your brush discharge applicator attached to another ground wire and try to give it to the patient, you can't give an effluvium. You can't possibly do it. Another thing that shows the way the static current travels is an experiment I show the students. I have a little thing shaped like a glass pipe. I fill that with water. Standing on the platform connected with the negative pole, I can tip that over so the water comes out the end of this pipe and it hangs

there just as a big drop and won't break because the positive currents in the students and the rest of the earth compared with my negative charge will push the water so it will hang in an abnormally large drop. I always show them the negative pole first. When I am connected with the positive pole, as soon as the water comes it flies out as a shower and wets everyone of them, you can't keep it in the pipe. That and the brush discharge show the current goes from the positive to the negative.

Vacuum electrodes are used to some extent with the static. We use the static wave current not only with Crooks metal plates, but with specially shaped metal electrodes it is used particularly with very great benefit in prostatic hypertrophy. I don't know a thing that will compare with static wave in subinvolution or some kinds of dysmenorrhea. With an electrode in the rectum you can make the uterus go back into position and it is really one of the most gratifying things in medicine to see the relief you can give the young girls who have had such terrible dysmenorrhea.

In prostatic cases it is of great value. In a meeting we had in New York this last spring, urologists present all agreed before operation it was the correct procedure to try static wave current on the prostate, because if it was only for the fact it didn't leave as much prostate to cut out, you could undoubtedly reduce the size of the prostate.

There are many uses for the wave current, but you must remember as in all physical therapy it induces one of the three effects that we can induce. Physical therapy is only made up of induced chemical, thermal and mechanical action and static is the main modality we have for inducing mechanical action. Those of us who do static (I know masseurs do not like the statement) can do everything with static electricity that any masseur can do, in a shorter time and better. You can have static graded

down to such a fine point that the patient can hardly feel it and give really a lighter massage than some people can give and for a longer time.

One of the things we treat a great deal is Bell's palsy. The patient holds a plate against the face. In neuralgia and sensitive conditions, you can treat the patient without hurting him and give sedative action and carry it on as long as you want, which massage can not do.

I don't like to talk of all the different conditions that static can be used in, because I feel that as in most physical therapy the largest part of physical therapy is ordinary medical common sense. You have to mix a lot of brains with any current you use and here you have got a current that will absolutely decongest. I think it is all right in this season of the year to talk about football. I have had fellows with sprained ankles and had them playing football again in four days. A sprained ankle is nothing at all to treat with static. Synovitis with effusion is very easily treated with static. I told Dr. Kobak that last night and he rather smiled. I had enough experience with those cases to say it is an easy thing to treat, and you can always get the fluid out.

One thing I want to speak of before stopping is the fact that the thing I saw last night in the report of the Council on Physical Therapy of the A. M. A. was that they said it was a combination of modalities that did the work. That is a very pleasant thing to have them say, because two years ago the A. M. A. took the stand when they published papers that they wanted papers on the use of one single modality, and we who wrote on physical therapy objected to the stand because we said no single modality in physical therapy could stand by itself, and that is absolutely true. Static can not stand by itself and I do not believe that diathermy can stand by itself. I think if we have a patient where diathermy is indicated and we give them

only diathermy and let them go, we are not giving them the full treatment we should give them. We are merely inducing a hyperemia and trusting the hyperemia will do some good. Whereas, if we follow with static or massage or something mechanical after we have induced the hyperemia, we are completing the series and giving the patient what he deserves.

I know most of the people in this part of the country do not realize what static is. I know Dr. Morse does and Dr. Pope; they used static long before I was born, I guess. They know what static is and I don't know of a man who knows how to use static, knows what a static machine is, who would give it up. I consider it the most necessary thing in my office. Incidentally, although the manufacturers do not like this statement, you can make about the best high frequency current from a static machine. I won't tell you how because that defeats all their business, but if you have a static machine, you can make about the best high frequency current from that machine you may want. In fact, last summer when Dr. Kobak and I visited d'Arsonval in Paris, his high frequency machine, the first one ever built, was still working. He uses a Rumkoff coil which gives an undirectional high voltage current. You very seldom see them nowadays. Alongside of it he had an old Van Houten and Tenbroek (I can mention the name because the company is out of business) static machine and he said the best high frequency current he got was from that old static machine or the Rumkoff coil. It is a very simple hook-up, but I'll guarantee the manufacturers won't tell you how it is done.

I would like to have Dr. Morse and Dr. Pope carry me along, if Dr. Elsom doesn't mind, and bring out some points I have forgotten, because this is all extemporaneous and I didn't know I had to talk until yesterday. As I say, I am a pinch-hitter. I will be glad to answer questions if they will leave anything undone, but I don't think they will.

#### DISCUSSION

CHAIRMAN ELSOM: It is very delightful I am sure to have such an enthusiastic exponent of the static current with us. I think if we could get a machine that was noiseless, if we could get one that was inexpensive, if we could get one that didn't occupy two or three rooms and if we could get one to which we had to pay no attention and one that wasn't affected by moisture, kind of a pocket edition, so to speak, I am sure we would all get statics before tomorrow morning. However, we have to take the good with some of the inconveniences. We shall be very glad indeed to hear discussion of this interesting talk. I think Dr. Pope no doubt is filled with information as he usually is on any subject. Dr. Pope, will you tell us something about static?

DR. POPE: No matter how much trouble a static machine may be, and it can give as much trouble as any other modality in medicine, no matter how much space it may occupy or its cost, those things don't for one minute interfere with its tremendous value as one of the greatest of the physical therapy agents that we have to deal with. I have had two large machines in constant daily use ever since 1890 and I have had some very interesting experiences with static, particularly with that particular phase of the static known as the Morton wave current. There is nothing in medicine that can duplicate it, in my opinion.

In the static wave current we have a current that produces not only the mechanical effects of which Dr. Titus has spoken but we have a current that produces a molecular activity in the cells themselves that it is impossible to do with any machine that acts altogether in a localized way upon muscular tissues. This is not limited to any one section or part of the body but is more or less universal. It is true that you only have a few milliamperes and it is true that you can, if you are careful, do no harm and you can do some harm if you are careless by shocking and scaring people, but that is all it will amount to. You can take a piece of paraffin and if you shoot it as a paraffin bullet swift enough, it will go through a plank. It is just like this in static; you are throwing a feather, if I may put it that way, back at the patient by a million volts. It is the concussory power of this breeze or effluvium upon the surface tissues that literally pounds out the congestion that is present. I do not think that any of the modalities touch that of the wave current. I believe there are many, many things that can be done with that which you can not do with anything else, and I am thoroughly in accord with Dr. Titus in saying that with the spark and with the wave

current we can accomplish more in the after treatment of diathermy than can be accomplished by ten diathermy treatments alone.

The honorable gentleman presiding knows that I personally object very seriously to the absolute limitation of men's intellects and activities to diathermy. I have given this state of the medical profession, this mental attitude a name in which I call it the deification of diathermy. You have erected your little god upon a pedestal in the way of diathermy, and I will say to you that the old and experienced members of the profession did pretty nearly everything that was done by diathermy with a galvanic current and the static wave before we had that particular current. Take that and think about it.

DR. FREDERICK MORSE: In my short career, I have owned thirty-two different static machines. Some of them were cast aside after a short time, some were the type with the twenty-four inch wheels, two revolving wheels and two plates, up to the present product you see in the adjoining room. I have one, a fac simile of the one on exhibition that I have used twenty-four years and it is going strong now. I speak of that to show how with reasonable care the durability can be maintained and the efficiency can be maintained if one will use a little care and common sense in taking care of it. We can't prevent moisture and climatic changes, but we can so arrange static machines that the sun will sometimes shine in our offices; we can get them far enough away from the wall so as not to have induction to take away our current.

By a proper appreciation of what is necessary to produce a static current, it is not hard to keep these machines going year after year. The gentlemen who have been talking have had long experience and they have probably observed those things.

As far as the therapeutic value, I will say "Amen" to what the gentlemen have been saying without any repetition of what diseases and conditions I would apply it to. Everything we have in our recent physiotherapy apparatus is bound to be more or less local in its effect, except possibly the autocondensation method of d'Arsonval. The majority of patients that come to our offices have more or less the result of infection about them and in addition to the local manifestations, whether acute, subacute or chronic. If the patient has passed the age of fifty or sixty, there are secondary conditions that have to be respected. It may be arterial hypertension, it may be intestinal causes or some local manifestation of the beginning of trouble.

The static machine, in addition to its local beneficial action on indurated and extravasated serum in areas, or whatever the trouble may be, gives the molecular gymnastics throughout the tissues that must necessarily cause an increased elimination through the skin, the kidneys, the bowels and breath that we get in no other way for the one reason easily explainable, and that is the enormous voltage behind it and the voltage means the driving power, and the driving power means increased elimination, of course.

That one factor alone, outside of its special virtues of static sparks, brush discharge, the actinic effect of the pencil brush in cores and so forth, through the wave current technic is in itself enough to establish a static machine almost as an essential to any one who is doing work enough to be called a well equipped physiotherapist.

DR. W. B. WALLACE (Detroit, Michigan) Does Dr. Titus use static in the treatment of locomotor ataxia and also in the treatment of cerebral hemorrhage?

DR. TITUS: In closing this discussion, I want to bring out the same point Dr. Pope did, that the static machine does take room. You have got to have a minimum of fifteen square feet for a static machine. That is a thing I hope you will remember, because some of you, I know, will come to static. Fifteen square feet of floor area is sufficient for a sixteen-plate size static machine of today. It does cost money. I don't think I want to quote prices, but it is worth what you pay for it. You can get more use out of that than you can out of many other fancy machines and it is worth the trouble.

It isn't hard to keep dry if you just give it ordinary care. I do not agree with Sampson that you must clean the whole inside of the machine with kerosene oil once a month and air it out and baby it, because the machine will go for years and years with just ordinary care. I personally use Babbitt's lye and it costs me thirty cents twice a year to keep my machine in perfect running order.

Another advantage about it is that there is no wear and tear. The gentleman who was sitting behind me said he had a machine which he ran for twenty-one years and never had any trouble with it. I think probably Dr. Pope has run some longer than that, not that he is the longest champion, but they will run for years and years with no wear and tear. The only thing that can possibly happen is the wearing off of the tin foil on the Leyden jars and that is very easy to have re-applied. You have to get them renovated once in a while. You have to take care that there is no scraping.

If the plates scrape the shellac will have to be renewed. The upkeep after the initial cost is exceedingly small.

Dr. Pope misunderstood what I said about comparing Dr. Morse's machine with the static; I said the Morton wave. The Morse wave has its uses but it is the Morton wave I spoke of which is a very efficient thing and can not be replaced. Remember that no machine but a static machine can generate static current and no current can take the place of the static current for the decongesting mechanical effects that the static current can induce.

When Dr. Coulter spoke the other night about the use of passive motion on joints and inducing pain and giving too much, I thought of this: One of the greatest uses of static electricity is in fibrous ankylosis of joints where you have used heat or diathermy first and then the passive motion. You can at that time actually traumatize the joint. If you don't do anything else, your patient will go home and have pain all that night and the next day and he will come back with a club because of the pain you gave him by traumatizing the joint in giving excessive passive motion. If you follow such motion with static brush discharge, you can take out all the effects of the trauma that you induced. Therefore, you gain by the extra motion you have given the patient just so much and you speed up the recovery of that joint and get away from the ankylosis so much sooner.

Dr. Wallace asked about tabes and cerebral hemorrhage. Tabes dorsalis should not and can not be treated with static electricity. There is no reason to expect that you will get any results. You can relieve the girdle pains and with the static wave current against the prostate you can somewhat help the bladder atony. That is all you can do for tabes dorsalis.

It was my good fortune when I was an intern to have a large series of tabes cases to treat and I picked

out the worst of those when I started doing electrotherapy and treated them with static for over two years at least twice a week, and I didn't do them a bit of good.

DR. KRUEZER: What manner of treatment do you give?

DR. TITUS: For the girdle pains we gave static sparks.

DR. KRUEZER: Did you ever try the Crown breeze?

DR. TITUS: It is a little more psychic than scientific. I think the Crown breeze has effect in giving dilation of superficial arterioles and in neurasthenia it is good, but as far as affecting the spirochetes living in the spinal cord, I don't think we can get at them with static electricity. Of course, those people are neurotic, you can't blame them. They have all sorts of pains you can't symptomatically treat. As far as treating tabes as a disease, I think static electricity is a failure.

In cases of cerebral hemorrhage, I think it is contraindicated just as static is contraindicated in deep seated infections. If you have a hemorrhage like a cerebral hemorrhage, and if you push a mechanical force such as static electricity into that area, you are going to spread the infection or hemorrhage. In deep seated infections it is contraindicated and in deep hemorrhages it is also contraindicated. In superficial hemorrhages, as in ecchymosis, it is really wonderful in its results.

In a report of the Council of Physical Therapy of the A. M. A. you will notice among the electrical modalities recommended was static electricity. Even though it has been laughed at for the last twenty years, you might say, the A. M. A. has put its approval on it and those of you who do it I am afraid do harm by being so enthusiastic, but it is a wonderful modality and I recommend it most highly to your consideration.

## PRACTICAL APPLICATION OF PHYSICAL THERAPY\*

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DETROIT

Physical therapy being an extremely elastic subject, I shall confine myself to that increasingly popular phase of it which deals with the practical application of electro-therapy.

How many physicians have equipped themselves, more or less completely, with apparatus: ultra-violet; radiant light and heat; high frequency; direct or galvanic; wave and sinusoidal; and various other physical therapy devices; and yet, few of the purchasers have a distinct understanding as to which, if any, of this varied apparatus should be used in any given case that may apply for help. There is great doubt in the minds of the majority as to why, when and what particular physical therapy treatment should be administered.

Let us first of all understand that all this apparatus for physical therapy—and physical therapy itself—assigns itself into one of three distinct categories: chemical, thermal, or mechanical in character. No matter what the electrical treatment, it will fit into one of these divisions; it may partake of the characteristics of two but one of them will predominate. The galvanic or direct current is essentially chemical in action, being either acid or alkaline in reaction. We do not think of it as a thermal agent, though a current of galvanism cannot be passed through the tissues without causing some heat, but this latter effect is only incidental. The chief characteristics of the galvanic current are due to its chemical action. On the other hand, the chief characteristic of a diathermy or high frequency current is essentially that of heat.

D'Arsonval, Tesla, Oudin, diathermy, auto-condensation, are all very ambiguous terms, as

even the user of such unscientific terminology often does not know the distinguishing mechanical and therapeutic characteristics of the currents about which he himself may be discoursing. It would be much easier to understand, and far more satisfactory, if all of us would distinguish the biterminal high frequency current of the primary from the biterminal and the uniterminal high frequency current of the secondary. The diathermic current is heat current, not because it is heat itself but because the high frequency vibrations, meeting with resistance, are then converted into heat. When we want heat within the tissues, diathermy is the only means by which intense heat may be safely induced without unduly affecting the skin. Such heat is developed within the tissues outward, whereas a hot water bag or a radiator enthusiastically heats the skin or superficial periphery but decreasingly affects the increasingly deeper tissues.

As mechanical agents, not essentially chemical or thermal in their character, we naturally think of the contractile or rhythmical currents: the wave and sinusoidals of low voltage and the condenser discharge or Morton wave of high voltage from the static machine. We recognize that even purely mechanical exercise of tissues may induce some heat and even chemical changes, but these effects are only incidental and not preeminent.

Diathermy is essentially thought of as heat but from its thermal effect there will also naturally arise some chemical action, but this latter will be incidental or subsidiary. Each one of the modalities or treatments I have mentioned, naturally and unerringly falls into one of our three previously mentioned categories, and it is

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the predominating characteristic of each that should lead us to think of its indicated or non-indicated applicability in any given case we may be considering. Quite often two or even more variant treatments may be quite advantageously combined. The stimulation of negative galvanism is often additionally enforced by following with some contractile current; diathermy frequently needs synergistic aid from a Morton wave or the sinusoidals; diathermy or radiant light and heat and positive galvanism are synergistically sedative; some form of ultra-violet, especially that derived from the carbon arc, is generally indicated as a metabolic activator following almost any indicated local treatment or treatments.

Ultra-violet belongs to the chemical category. It is certainly not mechanical, and only negligibly thermal in its effects. In this country, the majority of the profession think of the quartz mercury arc as the inevitably indicated form wherewith to apply indicated artificial heliotherapy. In England and various parts of the continent, the carbon arc is more popularly thought of and used. To understand ultra-violet and light therapy generally and particularly, it is essential to understand the physics of light and to know the spectra of the various lamps. Ultra-violet rays have a wide range; some of them exist even in the visible spectrum; some are essentially bactericidal in character and others are as essentially stimulant or metabolic. One type of lamp, no matter how excellent and intensive, will not efficiently serve all the needs and indications for phototherapy.

Diathermy means heat and would be pre-eminently indicated in the treatment of pleuritis, pneumonia, and other deep seated pathology where heat might be advantageously indicated. A radiant light and heat lamp will evoke heat and—like diathermy—is conversive in character, but is only penetrant to about one and a half inches within the tissues. Therefore the lamp will not be indicated for

thermal treatment of deeply seated pathology, but will act beneficially where merely superficial or mild heat is only required. Many skin lesions will respond more beneficially to ultra-violet or other indicated treatment if initially stimulated by application of a radiant light and heat lamp. Invariably suit the treatment to the particular case. One does not use a nut-cracker if a sledge hammer be necessary, nor vice versa.

As an illustrative case for discussion, let us suppose a patient with an acute ovaritis suitable for physical therapy treatment. Prolonged hot douches; hot packs; fomentations over the abdomen, would be somewhat helpful but—she is in your office for treatment and some immediate relief. You have a varied physical therapy outfit but, unfortunately, are not so well equipped in experience as to discriminately decide what should be the choice of treatment. For this common gynecological case, should we think of some mechanical form of treatment: a contractile current, traction, vibration? What does acute inflammation imperatively indicate? The need for rest. We knew that even before Hilton told the world. We certainly should not think of any stimulant or irritating treatment. Would we use diathermy? Most authorities tell us that the intense heat of diathermy is not indicated in the treatment of acute inflammation; we do not think of diathermy as being indicated. The mild superficial heat from a radiant light and heat lamp would possibly be indicated—if it could penetrate deeply enough. However, let us consider the galvanic current; the direct current, which latter name is the more correct term. We do not have galvanic currents anymore; a true galvanic current is only derivable from cells. The direct current, however, though not quite so smooth in action, for all intents and purposes quite satisfactorily takes the place of the true galvanic. The positive pole of the direct current constricts blood vessels and is therefore sedative in character; sedative and pain relieving in acute inflamma-

tory conditions. Therefore, for the treatment of acute ovaritis, we should think of the positive pole of the direct current. If we were to reverse and use the negative pole in this case, we would not only not obtain the desired results but would materially aggravate the condition. If, on the other hand, this were a case of chronic and not acute ovaritis, but the patient complaining of pains and aches, we might still be tempted to apply the positive pole because we have read so much and heard so much about the positive pole being invariably indicated as a pain reliever. I believe I was one of the first, in my classes, to emphasize the fact that both poles may be pain relieving when given the indicated condition. Why is pain? It arises from pressure. In acute inflammation there is distension and pressure arising from an overactive circulatory and lymph supply. The positive pole acts as an anodyne in such acute conditions because it is vaso-constrictive and thereby reduces and limits excess fluid and pressure.

In chronic painful conditions what have we? Just the reverse. Now we have the ashes and debris from a burnt out fire. The acute inflammation has degenerated into a chronic one, which means connective tissue changes: fibrosis, microscopical or macroscopical. There is consequently constrictive pressure upon nerve endings and accompanying pain. In this case what will the positive pole do? It will accentuate the pain by accentuating the pressure arising from its vaso-constrictive effect. The negative pole is here indicated as a marked pain reliever because of its vaso-dilative, softening effects. Even this sketchy and general review of but a few of the various physical therapy treatments: electrotherapy, phototherapy, intelligently illuminates the practical application of physical therapy. Let us learn the physics and characteristics of the variously involved currents, lights, and other modalities. No authority can

tell us everything about these things, but some of the essentials we certainly should know. Our own experience will increasingly prove helpful, but that of others may help us to attain desired results more quickly and safely.

Physical therapy is but in the making; theories are changing, and apparatus and appliances will consequently have to change to accommodate themselves to the increasing needs and demands of the profession and of science. If one desires to practice physical therapy he must be equipped to do so. One cannot be expected to successfully employ hydrotherapy if he be in the Sahara desert without water. The possession of one appliance or even two does not mean complete equipment. The general practitioner is not expected to fill a suite of offices with machinery; neither, if he possesses one or two pieces of apparatus is he expected to condemn physical therapy: electro-therapy, because his limited equipment fails to function 100% upon the heterogenous pathology to which he may apply it. Let us, nevertheless, remember that one piece of apparatus thoroughly understood and expertly applied may prove of more benefit than the possession of more apparatus ignorantly applied. However, do not attempt to treat everything with one machine or method, as a panacea for all ills has yet to be discovered.

Even with a thorough knowledge of the physics and physiology of physical therapy; with excellent apparatus and appliances, it needs the well trained physician to diagnose and discriminate when and when not to prescribe certain measures; finally, the little practical things in technique: the application of electrodes, time and manner of administering the treatments, repetition and adjunct treatment, all this and much more means constant study, intuition, invention, and adaptability.

## HELIOTHERAPY IN CHEST DISEASES\*

J. J. SINGER, M. D.,  
ST. LOUIS

The spectacular reports of cures in ulcerative conditions of the skin and bones led us to try heliotherapy in chest wounds.

So much has been written on the physical and chemical effects of the ultraviolet rays on body cells that it is unnecessary to discuss them here at length. However, it is important to know what to expect when tissues are exposed to the sun or the ultraviolet lamp. That the ultraviolet rays, as well as the infra-red have an antiseptic effect is generally conceded. Whether the effect is local as well as general is not known. When we consider that post-operative chest wounds are usually bathed in pus and bacteria, it is reasonable to expect beneficial results from exposure to the sun. In addition general exposure is given for the general effect, and good results are obtainable after a few exposures.

As pulmonary abscess and occasionally empyema cavities are foul it is felt that light therapy should help in alleviating this condition. After a few applications of the light it was noted that the odor became less and at times became odorless. The pus became diminished in amount and the skin which was often macerated about the edges of the wound became dry and clean. In a general way these patients felt better, their appetites improved and they gained weight.

The lessening of the purulent secretion in the open bronchi by means of heliotherapy, tends to diminish the desire to cough, but in

many cases this improvement was not very marked.

Heliotherapy in the chest service is supervised by a trained nurse who has made a special study of this work. She supervises the patients; takes pulse and temperature before and after the treatment; notes the reaction after the application of the sun or lamp, and records on a special chart the condition of the patient, so that an analysis will show just how much exposure a patient can take with safety. Any reaction will call for special attention on her part; if severe, she notifies the medical head of the service.

We have attempted to follow along the lines suggested by Rollier in his book, but have not adhered too closely to the scheme so familiar to you all. Every patient has his own tolerance, and we feel that he should have as much exposure as possible, in as short a time as is consistent with comfort. As most operators in this work have noticed, certain types of patients cannot tolerate the ultraviolet ray.

After the observation for three years of many post operative chest cases we feel that the application of light therapy is of great value in drying wounds and keeping them clean and free from odor, and that the general condition of the patient improves from complete exposure.

The application of heliotherapy in the chest service was undertaken with the approval of the department of heliotherapy of the Barnes Hospital under the direction of Dr. Ewerhart, whom we consulted as to the advisability of doing this work in the chest service. In view of

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\*From Department of Medicine, Washington University School of Medicine and Barnes Hospital.

our special interest in chest work and our willingness to put the light to test in this field, Dr. Ewerhart consented to have the treatments given outside of the heliotherapy department.

We believe that the clinical results warrant continuance of the application of heliotherapy. In surgical work it is rather difficult to judge the true value of heliotherapy as drain-

age is established by operative means and the natural tendency would be toward improvement.

In conclusion we feel that sun baths contribute greatly to the general welfare of all living things, and the local application of this beneficial aid has done all that was expected of it. When the sun is not available we feel that the ultraviolet lamp gives good results.



## PHYSICAL THERAPY IN CHRONIC LUMBAR PAIN\*

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The patient with a chronic "back-ache", was, prior to the advent of physical means of therapy, perhaps one of the least welcome visitors to the physician's office.

These patients present themselves as both a problem in diagnosis and in treatment, and the usual result has, as a rule not been quite a happy one, as witness the fact that the majority of these people have made the rounds of several physicians and still are not relieved. In fact, one finds that quite a large percentage have, at one time or another, been in the hands of at least one irregular cultist, and the average patient does not go to these people until rather desperate.

Physical therapy offers a means of relieving these patients of their pain, and if the proper means are used, results in a permanent relief. However, certain essentials must be observed if the best results are to be obtained. In this paper an effort will be made to outline these essentials.

### HISTORY

The histories of cases of lumbar pain are of great importance, because of the conditions in which physical therapy is contra-indicated. Broadly speaking, diathermia is contra-indicated in any condition in which there is the slightest suspicion that there is an undrained area of pus. The danger of septicaemia is very real in these cases if diathermia is used.

Tuberculosis of the spine, psoas abscess, meningial conditions, and tumors of the cord.

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or spine, all absolutely contra-indicate diathermia and static treatment for obvious reasons.

According to Cabot, the histories of 2451 cases of lumbar pain, show the following distribution of causes.

1. Sacro-iliac disease (non-infectious) .....	711	Cases
2. Lumbago .....	549	"
3. Hypertrophic Arthritis .....	351	"
4. Herpes Zoster .....	214	"
5. Infectious Arthritis .....	178	"
6. Acute sprain of back .....	149	"
7. Renal stone .....	109	"
8. Spinal tuberculosis .....	72	"
9. Renal suppuration .....	65	"
10. Perinephritic abscess .....	26	"
11. Renal tumor .....	16	"
12. Cancer of the spine .....	6	"
13. Retroperitoneal tumor .....	5	"

In this series it will be noted that over 50% of the cases appear under the classifications, non-infectious sacro-iliac disease and lumbago. Under non-infectious sacro-iliac disease may be grouped the pains which are so frequently associated with chronic infection of the pelvis, apical infection of the teeth, and chronic infection of the tonsils and sinuses. The infection, although not directly located in the back, nevertheless, may be and frequently is, the cause of lumbar pain, and while diathermia and static will benefit the condition, temporarily, a complete cure does not always result unless the infection is removed.

The acute strains and sprains of the back, so frequently encountered in industrial cases, yield to like treatment with diathermia and

static in a most gratifying manner. I would like to emphasize again, the importance of the role focal infection plays. Quite often a simple strain of the back may not clear up as expected. In these cases I always investigate the teeth and tonsils, and the removal of infectious foci is recommended. A purely traumatic back pain, may become a chronic one, simply because the traumatized area constitutes a point of lowered resistance, and an abscessed tooth, which formerly gave rise to no symptoms, may set up a low grade infection in the area of low resistance, which condition is very refractory to treatment.

A further cause of recurrent back pain in women is a chronic pelvic infection. Whether the back pain results from direct infection, or from the absorption of toxic products, co-incident with general poor health of the patient, I am unable to state. The fact that the back-ache remains, however, and the presence of a chronic endocervicitis should be considered in determining the cause of back pain in women.

#### PATHOLOGY

No attempt has been made to differentiate all the causes of lumbar pain. The causes are of great number but the resulting injury to the tissues is practically the same, namely, the infiltration with an inflammatory exudate which is not absorbed.

The location of this exudate, and the length of time it has been in the tissues, largely determines the severity of the symptoms.

Thus, a small amount of organized exudate or scar, surrounding the sciatic nerve will cause a greater degree of pain than a larger localized area of the same exudate in a muscle.

The point I wish to emphasize is, that the end result of inflammation, septic or traumatic, is an organized exudate, and the removal of this exudate is the aim of our treatment.

#### TREATMENT

##### *Diathermia—Physical Character.*

Before going into the application of this treatment, I wish to run over briefly, the physiological and physical aspects of diathermia.

Diathermia is the term applied to the conversion of electrical energy into heat, within living tissue. Diathermic heat differs from other forms in that the heat is formed in the tissue and not applied to the skin in the hope that it will be deeply absorbed.

Diathermic heat is obtained by making a high frequency current traverse the part which it is desired to heat. In its passage through this part, the current is offered a varying amount of resistance by the tissues lying between the electrodes, with the result that heat is generated within the tissue structure itself.

The amount of this heat is directly proportional to the resistance, or density of the tissues encountered by the current, and to the number and calibre of the blood vessels. Blood of course, is a good conductor of electricity, and some of this heat is conducted away by the blood.

Therefore, it follows that the least vascular tissue in a given area will be the location of the greatest heat, and that bone, cartilage, nerve and tendon structures will become hotter, during treatment, than surrounding and more vascular tissues.

On the above facts, the whole treatment is built, thus: Inflammatory exudate is relatively non-vascular and dense, and a high frequency current will generate whatever amount of heat is desired within this tissue.

##### *Physiological.*

We now arrive at consideration of the physiological effects of the heat that we are able to develop within the tissues. These may be sum-

marized here as (1) dilation of the blood and lymph channels, (2) speeding up of the circulation in the heated part, (3) sedation of pain, and (4) increase of phagocytosis.

Here then are the important effects of heat, and if the heat is applied to an area of inflammatory exudate surrounding, let us say, the sciatic nerve we will obtain the following results: (1) the vessels which are close to, and the few vessels in the scar tissue, are immediately dilated, and a large supply of arterial blood is soon bathing the affected part. (2) The phagocytic activities of the newly arrived leucocytes are greatly stimulated. (3) The scar tissue is softened and made more amenable to subsequent manipulation. (4) The pain, usually caused by a deficient blood supply, is relieved. (5) The vessels in the scar are stimulated to throw out branches and in time the non-vascularity of the dense area is changed to the vascularity of normal tissue.

Diathermia alone may not always clear up a case of lumbar pain, but if static electricity is used after a forty or fifty minute diathermia treatment the number of treatments required will be much less and the results will be very much better than with diathermia alone.

#### STATIC

Static treatment following diathermia may be likened in its effect to a sponge which has been soaked in water, and which is rhythmically squeezed and released, with the obvious cleansing of the sponge. In treatment, the tissues treated are the sponge, the cleansing material the blood brought to the part by the heat induced by the diathermia treatment, and the squeezing hand, the static machine.

The length of the spark governs the force of the muscular contraction and should be adjusted to the comfort of the patient. The contractions caused by the discharge are not pain-

ful, and are borne by even those patients who cannot bear manual manipulations of the painful parts.

The rapid decongestion of the parts under static treatment, usually further improves any painful symptoms remaining after the diathermia treatment.

#### APPLICATION OF TREATMENT

The diathermia current is applied in back cases as follows: Place patient on the couch in a sitting position. Apply soap lather to the painful area, and apply the mesh electrode. Soap the mesh well and apply the cord, cover all with rubber sheeting to hold moisture and holding the mesh in position, have the patient lie back slowly, making sure the cord from the machine strikes the mesh, and not the skin. Warn the patient that any shifting of position may cause a shock and a painful burn. Soap the patient's abdomen and apply a mesh 4 or 5 times the area of the one on the back. Soap and cover with rubber sheeting as in the back. Place sand bags over abdominal mesh and rubber to hold in position.

Turn on street current and open the spark gap a very short distance. Open spark gap a little at a time and take about ten (10) minutes to increase the current to the point of comfortable tolerance. Do not try to give a very large milliamperage but rather be sure that the voltage is as high as possible. Allow the current to flow for at least thirty (30) minutes after the highest point reached. Warn the patient to tell you if any hot spots develop under the mesh. If this should happen it is necessary to apply more lather. If you use plenty of lather at first and cover with rubber sheeting it will seldom be necessary to stop treatment and reapply electrodes.

#### APPLICATION OF STATIC TREATMENT

The static treatment is applied to the part which it is desired to treat by the application

of suitably shaped electrodes of block tin. The electrode is soaped and held in place by an elastic bandage or a sand bag. The electrode is connected to the positive pole of the static machine, and the negative pole is grounded. When the machine is started, the spark gap is slowly drawn apart, until a spark of the correct length and frequency desired is obtained. The spark should not jump the gap more frequently than ninety (90) times a minute, or a tetanic contraction of the muscles will result.

Use as long a spark as the patient will stand and continue the treatment about ten (10) minutes.

Either sparks or the Morton Wave may be used.

#### X-RAY

Every week the patient receives five (5) milliamperes at five (5) inch spark gap of X-ray. The time is one (1) minute, and it is given for its solvent chemical action on fibrous tissue. Sampson gives full technique.



## VALUE OF PHYSICAL THERAPY IN THE TREATMENT OF ACUTE TRAUMA TO JOINTS\*

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I am a surgeon by practice. We know that the subject of acute trauma to joints is an extremely large subject and volumes have been written upon this subject so that it is not possible that I may more than just touch upon a few of the conditions very slightly in my paper. I am going to confine myself to a few of the most common traumatic conditions met with in every day life, as contusions, sprains, dislocations and fractures in the joints or close to a joint.

In order that we may better understand the structures involved, let us first consider, briefly, the anatomical structures entering into a joint, and by the way, the joints I am going to refer to in my paper are those most movable joints of the extremities. Beginning from within out, we have at least two bones which are so formed in shape that they may glide or rub against one another with a buffer of cartilage and a synovial membrane to make this rubbing of the ends of the bone soft and smooth. Next come the ligaments, particularly in the larger joints, and the capsule surrounding the joint. Then come the tendons, muscles, facia and skin.

Now, trauma may be defined as anything that will disarrange or destroy normal cell structure.

Contusion or bruise from without, causing sufficient irritation to the joint proper, injuring its capsule or synovial membrane, will immediately give rise to symptoms of pain, swelling and discoloration, increased synovial fluid, and if the injury is severe, may have hemorrhage

in the joint. This condition will make moving of this joint almost impossible.

*Sprain*—A sprain is a condition in which a joint is twisted beyond its normal limits and necessarily causing a stretching and probably a tearing of the ligamental structure of the joints. This condition is also immediately followed by symptoms of pain, swelling and usually discoloration due to hemorrhage which is later followed by increased synovial fluid and usually some hemorrhage in the joint. As a case of severe contusion, motion in this joint will be very greatly restricted during the acute stage.

*Dislocation*—In dislocation we have displacement of the bones of a joint so that their articular surfaces are not in apposition. A condition where the distortion is only partial is also known as subluxation. Dislocations always injure the synovial membrane and always tear the capsule. This condition not only gives us pain, swelling and discoloration, but pronounced deformity as well, and a joint, even after reduction, may suffer of increased synovial fluid and hemorrhage within the joint cavity.

*Fractures in or Very Close to a Joint*—This condition is the most severe of the group just mentioned and will depend largely upon the severity and type of fracture as to the amount of the injury that will have been done to the joint. This same thing will hold true as to the amount of injury done to the soft structures, such as the blood vessels, nerves, tendons, muscles and skin. If the skin is ruptured we have then a compound fracture and by the air being allowed to impregnate this wound, severe infection may follow.

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Since the synovial membrane appears to be injured in the minor as well as the major injuries, let us consider for a moment the physiology of the synovial membrane and the pathology that is the result of the acute trauma to a joint.

*Physiology*—The physiology of the synovial membrane is to form a smooth surface over the articular surface and to secrete a secretion to lubricate the joint.

#### *Pathology*—

##### 1. Hydrarthrosis. (a) Chronic serous synovitis.

Effusion of a serous fluid in a joint cavity is found in various types of joint diseases; it develops on account of an irritation to the structures of the joint. But such an exudation may also follow after even slight contusions to a joint or after distortions and then we must designate such a condition as a traumatic serous synovitis.

The chronic serous synovitis may primarily occur as a chronic disease or it may result from an acute synovitis.

If the latter is not treated or if it is neglected, the serous exudate remains unabsorbed and may persist for an indefinite time. If the absorption of the exudate extends over a long period of time, it produces a gradually developing thickening of the articular lining favoring periodical re-occurrences of the exudation in the joint.

(b) A clinically interesting picture is the so-called "intermittent hydrops" of a joint, particularly observed in the knee joint. The first attack starts not uncommonly in connection with an injury to the joint. The accumulation of fluid occurs then intermittently in two to four week periods, accompanied by pain, while during that time no disturbances are noticed.

##### 2. Hemarthrosis.

A contusion of the patellar region often incites a hemorrhage in the prepatellar bursa. This is also true in the elbow joint. Due to the anatomical fact that this bursa is located close beneath the skin, injuries to the skin, such as lacerations, contusions, etc., may directly lead (per continuitatem) to a purulent prepatellar bursitis.

If a trauma affects an already diseased prepatellar bursa (chronic bursitis) with subsequent hemorrhage or exacerbation of the inflammation, the proper way of treatment is the surgical removal of the bursa, as the local treatment is tedious and often unsuccessful.

Hemorrhage in a joint indicates the severity of a trauma. Such an effusion of blood may develop following injuries to the cartilaginous surfaces of the joint in form of superficial or deep fissures, or separation of small or large sections of the articular cartilage from the underlying bone, etc.

The hemorrhage may also result on account of laceration of the attachments of the intra-articular ligaments with or without infraction of a bony fragment; contusion of the synovial membrane may also be considered as a source of bloody effusion.

The extravasated blood may remain in its fluid state or it may coagulate. The clotted blood covers and adheres to the synovial surface and produces a constant irritation of the same leading to a thickening of the articular capsule and favoring a chronic serous exudation. As long as clotted blood covers the joint lining it hinders the absorption.

In young individuals the absorption of an effusion of blood in the joint usually occurs within a short period of time; in adults it progresses slowly and may end in a chronic serous arthritis.

An extensive accumulation of serous fluid in a joint by simultaneous flabbiness and distension of the capsule indicates infallibly the presence of an old effusion.

A distortion of a knee joint or any other joint may be followed by a so-called traumatic arthritis, a chronic deforming inflammation of the joint. It results from circumscribed injuries to the cartilagenous or bony parts of the joint with necrosis and subsequent proliferations of cartilagenous tissues. These conditions and processes may persist for a longer period of time, leading to a post-traumatic irritation of a joint which may heal or lead to an arthritis deformans.

*The Symptoms of Acute Injury to Joints*—Immediately upon receipt of an injury, or within a few hours, the affected joint feels hot to the patient, also stiff and often as if it were filled with hot sand. Certain movements are not comfortable and the muscles feel shortened. Pain is usually present and is increased by motion so that certain definite positions, peculiar to each joint are, as a rule, adopted. The hip is flexed and abducted. The knee is flexed. The ankle is found in a plantar flexion. Swelling is seen more readily in the superficial joints, such as the elbow, and less noticeably in the deeper joints, such as the hip. This swelling is due to synovial fluid that is secreted and distends synovial sac and the capsule. Fluctuation can be felt. This condition is usually developed in from one to three days and is usually found at the elbow, shoulder and knee joints and rarely found at the wrist, ankle or hip.

*Diagnosis*—The diagnosis of traumatic synovitis rests upon the presence of effusion in the joint following trauma, local tenderness, restricted motion in the joint, muscular atrophy and the general pain and discomfort about the joint. Differential diagnosis I mention only because of the treatment. Traumatic synovitis must be differentiated from: First, peri-articu-

lar injury; second, bursitis in the neighborhood of a joint; third, fractures or rupture of ligaments or muscles about a joint; and fourth, most particularly from tuberculosis of a joint.

*Sprain*—This term is somewhat loosely applied to a certain class of joint injuries which present the same characteristics but differ somewhat according to the special joint structures that are most effective. We may thus recognize one or more of four types of injury: First, where the synovial membrane is chiefly affected; second, where the ligaments are the parts most injured; third, where the tendons or the joint are the chief seat of inflammation; and fourth, when a contusion over the joint is the main cause of the symptoms.

As I stated following my definition of sprain, the symptoms consist of severe pain at the time of the injury and are usually followed by swelling and stiffness. Ecchymosis is present in most cases. Tenderness is present and is most marked over the injury. This, sometimes, is of the greatest value in determining what part of the joint has been chiefly affected. Under favorable conditions, the symptoms subside in from two, three, or four weeks, depending upon the severity of the injury, impairment of function lasting the longest.

*Traumatic Dislocation*—There are certain anatomical peculiarities which favor dislocation in certain joints, especially the ball and socket variety. Favorable conditions for the occurrence of displacement of their articular surfaces exist. The shoulder joint being more susceptible because of the large head of the humerus and the small shallow glenoid cavity of the scapula. Dislocations are also favored by loose capsules, weak ligaments around the joint. Dislocations are rare in children; most common in the middle aged and in the upper extremities. Most frequent because of falls upon the outstretched hand favoring dislocation at the shoulder joint.

*Exciting Causes of Dislocation*—Exciting causes of dislocation may be classified as follows:—Those due to indirect violence, direct violence and muscular action.

*Indirect Violence*—An indirect violence is the most frequent cause, the force being applied at a distance from the joint. This is best described in the shoulder joint. After a fall, for example, upon the outstretched hand with the arm rigid and abducted, the head of the humerus is carried beyond its utmost limit of physiologic excursion and finds itself rested upon the edge of the glenoid cavity which acts as a fulcrum, the long arm of the lever corresponds to the shaft and the short arm to the head. The force continues to act at the long end of the lever and head is then forced away from the glenoid cavity. Dislocations from indirect violence, of other joints, are produced in the same manner. The capsule is stretched to its utmost and finally yields and tears and the head of the bone escapes through the laceration.

*Direct Violence*—Dislocations by direct violence are very rare. In this form of dislocation, the force acts upon one of the bones forming a joint and forcing it away from the other bone. A severe blow to the head of the humerus may produce such a dislocation.

*Muscular Action*—Only a few joints are subject to this type of dislocation. The shoulder joint, by throwing a ball or reaching far above the head. Also the jaw by yawning and laughing, and more rarely the patella.

*Pathology of the Dislocation*—The usual results of a simple uncomplicated dislocation are the rupture of ligaments and of the capsule of a joint. Less frequent are fracture of the articular surfaces, displacement of the cartilage of a joint, partially or completely, rupture of blood vessels or nerves, laceration of the muscles and other soft parts.

*Treatment*—We may go back as far as we please in medical literature and we will find

that there were not only medical diseases and conditions to treat but traumatic conditions as well. It is true, however, that a great deal more effort was made and a great deal more energy was spent in trying to combat disease and in trying to prevent disease than was ever thought of with reference to injuries to the human body.

We need not go back many years when a man received a serious injury to one of his limbs and the attending surgeon got an impression that he could not make a very good looking limb out of it, he would amputate it because a surgical job that did not look good to the eye after it was healed, perhaps due to some deformity, was not considered good surgery. No attention was given to its functional result. It is only since industrial laws have been instituted, that medical science has made rapid strides in industrial surgery. Not many years ago a man doing industrial surgery was considered a very minor surgeon and this work was usually left for the beginner or interne. Today we look upon the industrial surgery, particularly the major part of it, as the most difficult surgery there is to perform.

Today industrial surgery is considered as reconstructive and rehabilitative surgery and is, without a question of a doubt, the hardest kind of surgery there is to do. This is because each case is so different from any other case of its kind, and because there is so much destruction of tissue. The surgeon must recognize and preserve every bit of tissue so that with our newer methods of treatment as is accorded us by physiotherapy, reconstruction and rehabilitation can be accomplished and a good or useful function can be acquired. A man who is unable to earn a living for himself today is a nuisance to himself and a burden to whoever must take care of him.

I have confined my paper to traumatic injuries to joints because injuries are more pre-

valent in joints and also are far more serious and require more careful study and treatment in order to get a good functional result.

Now, physical therapy has been practiced for many years and without any appreciable results being attained. It was not until our recent World War that physical therapy made sufficient success by accomplishing results where all other means had failed that we are allowed to use it today and still maintain our reputation.

There can be no question at all, in any sane physician's mind, but that physical therapy has been one of the greatest adjuncts that has been brought to the medical science in recent years and that more poor invalids have been relieved, benefited and made happy by it than by any other means at our disposal. We must not, however, forget and let our enthusiasm carry us beyond success for physical therapy, like all other means, cannot do everything.

Now let us consider how physical therapy accomplished its results in the conditions I have just put before you. While diathermy is the modality that is most adaptable in the treatment of this type of injury we will consider the action of diathermy upon the injured joint. The first thought in the injury of a joint must be, after you have learned the parts injured and the extent of the injury, how to restore this joint to as nearly a normal joint as possible and to do it in the least possible time and with as much comfort as is possible to the patient. If the injury is one of a dislocation, this must be reduced and the joint put in a most comfortable position and such treatment instituted as will give the patient relief of pain and start him off to a good recovery.

Formerly an injury to a joint of any degree of severity was always recognized after it had healed, by some permanent defect. This no doubt is due to the fact that the joints are

more susceptible to injury because of their exposure and also because of their peculiar construction and lack of nutrition.

Years ago, before the days of scientific physical therapy, in the case of a dislocated joint, we reduced the joint, applied immobilizing splints for a number of weeks, perhaps four or five weeks, depending upon the joint involved, and then took off the splint to see what kind of job nature had done. We usually found a joint more or less fixed and some atrophy of the muscles around the joint and when we attempted to restore the function or motion in the joint the patient complained of severe pain and another two or three weeks was lost before this patient resumed his regular line of duty and perhaps earned the same salary he did before the injury.

Today we will take this same case, reduce the dislocation and give him a treatment of diathermy as soon as possible following the reduction which gives him relief of pain, because the pain is mainly due to pressure and tearing of tissue and by its power of producing an arterial hyperemia and necessarily increasing the venous and lymph flow thereby increasing local metabolism and bringing an increased number of phagocytes to the injury, the swelling and pain will be reduced and the tissues repaired. In a few days passive motion can be commenced and the normal function of the joint restored in a few weeks. In a case of one of the large joints, where the capsule is torn, a few weeks may be necessary before active motion can be instituted.

In a given case the time is cut almost in half from the old method and with far better functional result. Now let us see if that means anything worth while:—Here is a man injured, referring of course to a man in my state which carries the compulsory compensation, who has a moderately sized family and who earns \$35.00 per week. While he is temporarily disabled

by reason of his injury he receives the maximum compensation which is \$18.20. In six weeks, which is the average time of temporary disability for a dislocation or sprain of a joint, he has suffered a financial loss equal to \$100.00. If he cannot do the same work he did before the injury he will have suffered some permanent loss. Now the compensation for the permanent disability will bear a very close relation to the temporary disability. In that I mean the compensation he will receive for permanent disability will be to his future loss in wage as the \$18.20 was to his \$35.00. So we can see how we have benefited the individual by instituting this treatment and thereby cutting down his healing period and also have benefited the insurance carrier in having to pay less compensation and in turn have benefited his employer by having this man back at his work.

In summing up the old methods and the new, as it were, there seems to be little doubt that in most cases, particularly of severe injury, we have a very decided advantage in getting functional results by the use of physical therapy than we did by the older methods of immobilization until the injury had become healed and then resort to passive motion for our functional result.

If we stop to consider that early after the injury, by reason of the exudates that are formed, if we can carry them away before they have become organized, we have greatly reduced the possibilities of fixation of our joint. In doing this and in also reducing pain and discomfort of the patient by allowing it to become greatly swollen and under great pressure, I think we have indeed succeeded in accomplishing two great advantages.



## PHYSICAL THERAPY IN ORTHOPEDIC SURGERY\*

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I feel gratified at being asked to present a paper on "Physical Therapy in Orthopedic Surgery", because physical therapy is probably more closely associated with orthopedic surgery than with any other branch of medicine. The orthopedic surgeon uses physical therapy to a greater or less degree in almost all his work, consequently the orthopedic surgeon is more interested in the progress and development of physical therapy than almost any other member of the medical profession.

I shall not discuss the technic of physical therapy because I believe that this phase will be more scientifically treated by men who are experts in the subject. Physical therapy is a definite specialty. It covers a large field and is becoming such an important factor in the treatment of so many conditions, that its administration should only be in the hands of the competent; and by competent, I mean those who not only thoroughly understand the technic of all branches, but those who have also had medical training in order to direct the treatment intelligently, and to appreciate the dangers that may result from ignorance or from excessive zeal.

Physical therapy is an important therapeutic agent but it has its limitations, and unless it is used with discretion much harm may be done, and a valuable adjunct in the treatment of many surgical and medical conditions, especially orthopedic, may be lost to us as a result of its falling into bad repute, either as a result of exaggerated and unwarranted claims or of ill advised and improper administration.

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Physical therapy is of greater help to orthopedic surgery than to any other branch of medicine, and the orthopedic surgeon has recognized its value for a longer time. The orthopedic surgeon, and also every other physician, who uses physical therapy should understand the principles to be used, and if it is being given in his office he should also understand the technic sufficiently well to be able to supervise the administration even when given by a competent assistant. It is needless to say that physical therapy should be administered only with a definite end in view, the cure or improvement of some condition, and not just to be doing something.

In orthopedic surgery physical therapy is used as a curative agent and also to restore or improve function, and of course both are often combined.

Physical therapy may be divided into: hydrotherapy, light, electricity, massage, therapeutic exercises and heat from various sources. Hydrotherapy includes Scotch douches, other contrast baths, whirl-pool and the various types of medicinal baths. Light comprises, the radiant heat lamp, ultra violet and the infra red ray and other light rays. Many of the forms of light are used as a source of heat. Electricity includes diathermy, the various forms of galvanic and faradic current, the low voltage and sine wave. Under massage and therapeutic exercises are grouped, manipulations to increase joint motion, postural appliances designed to accomplish these ends.

I have not included heliotherapy in this classification, not because I do not consider it of great value, but because it is really a dis-

tinct therapeutic agent, and requires a suitable location for its use and an entirely different equipment.

Heat in the form of radiant heat lamp, infra red and diathermy is most beneficial in the treatment of acute and chronic joint infections. In acute infections, however, in the presence of pus heat must not be allowed to take the place of surgical interference, otherwise serious harm may be done. Physical therapy seems to be particularly useful in subdeltoid bursitis. The course is considerably shortened. In a number of our cases there has been a deposit in the bursa which disappeared under treatment.

In stiff and painful joints heat, used before massage and manipulations has proved most useful. The joints and muscles are rendered much more pliable so that a greater degree of motion can be obtained. Recently we have been using diathermy immediately before a forcible manipulation under an anesthetic. The procedure seems to have been of value. In infantile paralysis heat is useful in all stages. In the acute stage baking and diathermy are soothing and beneficial. They relieve the pain present at that period. Massage should never be used, however, in the acute stage. It is distinctly contra-indicated. In the late stages heat is an essential adjunct to massage and muscle training. It not only renders the muscles more sensitive to nerve impulse, but it also increases the blood supply and promotes the metabolism of the muscle.

In non-purulent gonorrhreal arthritis radiant heat and diathermy are valuable aids to treatment. It is essential, however, to remove the primary foci in these cases if satisfactory results are to be obtained. This point is illustrated in two recent cases: A young woman with an arthritis of the wrist was seen a few weeks after infection. The condition seemed simple at first but in spite of vigorous physi-

cal therapy and other treatment she did not improve. The wrist and hip became stiff. Finally it was necessary to incise the Skeen glands. Since then there has been improvement in the condition but there is still much limitation of movement in the joints, some of which will probably be permanent. It is possible that the infection of the Skeen glands might have been successfully treated by diathermy.

The second case was a young man with a gonorrhreal arthritis of the wrist. He was seen immediately after the onset of the infection. He had had a urethritis two or three weeks before, but said he had been cured. There was no urethral discharge or other local sign. He was immediately given active baking with the infra red ray and diathermy. The condition improved somewhat but did not clear up as rapidly as was expected. A genito-urinary examination showed much gonorrhoeal pus in the prostate and seminal vesicles. A vaso-puncture was considered, but on account of the patient's age and the possibility of sterility we decided not to do a vaso-puncture, but to try diathermy first. Since then there has been a steady improvement in the wrist.

Baking is also of value in osteo-arthritis. It, combined with the other forms of physical therapy, will lessen the pain and increase function. Of course it will not cure the arthritis, which can only be done by the removal of the primary focus. When this has been accomplished physical therapy helps to restore function.

Hydrotherapy is of use in the later stages of some of the chronic infections, and particularly in some osteo-arthritis cases. The contrast baths are stimulating and improve the general condition. They are also valuable aids in sprains and joint injuries. They must, of course, be combined with baking and massage. This combination is also essential in the treatment of weak and painful feet.

Low voltage and sine wave currents are useful in joint injuries, contractures and muscle atrophy.

Massage is one of the most valuable aids that we have. It is used in conjunction with almost all the other forms of physical therapy.

I have not as yet mentioned fractures. There is no field in which physical therapy is more useful, I might say essential. Unfortunately its use in these conditions is not nearly as great as it should be.

Heat, in its various forms, and massage are most important in the treatment of nearly all fractures, and especially in fractures near or into a joint. Unfortunately too many physicians think that all that is necessary in treating fractures is to put them up in a splint or cast and keep them there until union has taken place; and only too frequently the splint is allowed to remain on the patient after union has taken place. After the splint is removed there is often a long and painful process of readjustment, frequently followed by permanently stiff joints, malformations and swelling. The period of disability lasts many months longer than is necessary or may be permanent, and unfortunately in many cases nothing is done to shorten this period. This is often a very serious condition, especially in a wage earner, who is needlessly kept from work, and who may be permanently crippled.

In fractures physical therapy should be begun early. Heat may be used almost immediately after the injury, and gentle massage may be started within a few days. If there is injury to the joint gentle motion should be begun at the end of the first or second week. I also want to emphasize the importance of mobilization of the fingers in Colle's and similar fractures. It is much easier to keep the joints free than it is to secure motion after they have become stiff. This is true in all joints. Hydrotherapy is of great value in those cases in which there is much swelling, induration and stiffness and in which the tone must be restored. Heat and massage promote union, lessen swelling, ensure joint motion and function and lessen the period of disability. Often, too, they give a good functional result in cases which might otherwise have been poor.

Physical therapy in all its forms is one of the most valuable aids to the orthopedic surgeon. It is used in some form in nearly all orthopedic conditions. It is of value, however, only if used correctly, and should not be prescribed until after a definite diagnosis has been made. It must be administered by those who know not only the theory but also the practice. If improperly used the possibility of danger is great. Above all we must remember that it is not a cure-all but a most valuable form of therapy. If this is forgotten physical therapy may be placed on the plane with many of the quack remedies of the past, present and future.

## A BRIEF CONSIDERATION OF AUTO-CONDENSATION IN HYPERTENSION\*

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Auto-condensation has been employed for many years in hypertension and other conditions. The high frequency current is required and is produced by a high frequency or diathermy outfit. A rate of frequency or oscillation, high in a commercial sense, would be entirely too low and dangerous for therapeutic purposes. A rate of oscillation of 10,000 to 30,000 per second does not cause muscle contraction and therefore is not dangerous; however, a rate of 800,000 to 2,500,000 is usually employed. The high frequency currents are known as d'Arsonval, Tesla and Oudin. The d'Arsonval and Tesla are used bi-polar for auto-condensation.

An office model outfit, rather than a portable, is essential to the best work. The important parts of the apparatus are the spark-gap, which is the heart of the machine, and secondly the voltage control transformer, step-up transformer, condensers, d'Arsonval solenoid and Tesla coil. The Oudin current is unsuitable for auto-condensation as it is used unipolar only and has insufficient amperage.

The 110 volt, 60 cycle, alternating current is the one usually employed. Its voltage is regulated by a control transformer after which it enters the primary winding of the step-up transformer. The street current as such goes no further. It generates magnetic lines of force in the primary which circulate in a rectangular, laminated iron core and by inductance generate a current in the secondary winding. From that point on we are dealing with an entirely new and different current, but it is still a low frequency current in spite of the fact that its

voltage has been greatly raised at the expense of a corresponding reduction in amperage. This induced current is stored up, as it were, in the condensers until the pressure is great enough for it to overcome the air resistance of the spark-gap. It is this operation of the condensers in relation to the spark-gap that causes the frequency of oscillation, and the rate of frequency will depend mostly on the condenser capacity; hence the fact that our machines have had only one frequency which has been practically the same on all of the modalities. The current leaving the machine is not dangerous to the patient, nor the operator, since it now has an enormously high rate of frequency; however, the operator might be in danger if he attempted to repair the apparatus without turning off the line switch.

The question of "what frequencies are most valuable" is one requiring further study. That a frequency of 800,000 or lower is best for diathermy, and one of 1,500,000 or higher is best for auto-condensation is gaining adherents. Professor d'Arsonval is quoted as saying "the higher the frequency the better."

Some writers are strongly partial to the thick,  $2\frac{1}{2}$  in., auto-condensation pad, while others prefer the convenient thin, mica insulated pad. The writer has used both and has not observed a difference. A wooden table should be used. Modified currents are in general use. Most machines do not have both the d'Arsonval solenoid and Tesla coil, and the Tesla is produced by tapping the solenoid in a way to raise the voltage and lower the amperage. If only voltage and amperage are considered this would seemingly produce a genuine Tesla current; but this conception omits the fact that the

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current takes its character from the electrical field of the coil and the shape of the two coils is entirely different; hence a difference in the shape of the electrical fields and perhaps a difference in character of current and in its therapeutic action. This question should be studied by physicists especially equipped for the task.

The essayist assumes that he may discuss the apparatus which he designed and uses without being suspected of exploiting, after stating that this machine is not on the market. It was designed in 1925 for the writer's own use as no machine with more than one frequency was available. There was some demand but manufacturers replied that it could not be done; that the price would be prohibitive; and that it would add confusion by additional switches. The answer is that it has been done; that it adds but little to the cost; and that changing frequencies requires only the turning of one simple frequency switch. It is a large office model in a solid mahogany cabinet with three white Italian marble switchboards. It has a voltage control transformer of the choke coil type, and a step-up transformer of 33,000 volts, both oil immersed; crystal glass, oil immersed condensers with aluminum sheet 1-32 in., between the glass; a twenty point tungsten spark-gap; d'Arsonval solenoid; pancake type Tesla coil; and Oudin resonator on top, and all are operated independent of each other. When one modality is in use a selector switch cuts out the other two. This machine has three frequencies on each of the three modalities. The frequencies are approximately low 800,000; medium 1,500,000 and high 2,000,000. The resonance was checked with a wave meter. Indebtedness is acknowledged to Mr. A. R. Darling for his genius in construction and to Dr. Burton Baker Grover for suggestions on the most desirable frequencies and for constructive criticism.

Portable outfits have been inferior for auto-condensation for several reasons, among which are that they are not provided with Tes-

la current, or produce a modified current called Tesla with no meter reading; that the potential is not sufficient, especially when the thick pad is used; and the spark-gap with its few points is neither suitable nor durable. The essayist believes that the above objections could be overcome to a large extent by installing both a solenoid and Tesla coil with meter reading on both; by making a more elaborate spark-gap; and by providing greater output of current.

As therapeutic effects of auto-condensation we may mention that it raises metabolism, increases the output of urea, improves nutrition, induces sleep, lowers blood-pressure and hastens the absorption of exudates. Normal blood-pressure is little effected by auto-condensation. We may secure the benefits of increased metabolism without lowering the pressure. In auto-condensation the patient's body takes the place of one layer of metal in a condenser, or Leyden jar, while the auto or self receives a condenser discharge which means cellular massage with the production of a considerable amount of heat in the patient's tissues. The pressure usually drops 10 points or more at a treatment, but after several hours it will be found nearer the starting point. A net gain of 5 points or less is satisfactory.

The selection of the patient is all important. A general examination should be made with special reference to cardio-vascular-renal disease; focal infection, such as that found in diseased tonsils, teeth, sinuses, gallbladder, colon, appendix, rectum, prostate, and pelvis. Also, endocrine dysfunction and syphilis should be ruled out. Emotional states are often an important factor and we should insist on better mental hygiene. Many cases first have psychic tension. Sclerosis cases are to be included for treatment unless far advanced; however it is much better to treat these cases before sclerosis is established using dietetic and hygienic measures in conjunction with auto-condensation.

The selection of the modality is the next step. In most cases we begin with Tesla, especially for its detoxicating effects. The treatment is milder and produces less heat, and is better tolerated by the older and weaker patients. When the patient ceases to improve under Tesla, or proves to have sclerosis, we should change to d'Arsonval.

The technique should be carried out with care. Daily treatments should be given at first and later three times a week or twice may be sufficient. We should begin with a small dose and increase gradually studying the pulse and blood-pressure at each treatment. It is advisable to record the pulse and blood-pressure before and after each treatment. It is best not to give the treatment on a full stomach the first two hours after meals, and to have the colon fairly empty. This is especially true in using d'Arsonval which, on account of its greater heat production, may liberate toxins faster than they are eliminated. We should start the treatment with the ma. at zero and spend three minutes working up to the desired amperage. When treated long enough the current should be gradually lowered to zero but this may be done in less than three minutes. Nervous patients who say they cannot tolerate electricity often base their opinion on some unpleasant experience such as being shocked with a Faradic battery. Such patients may develop tolerance if the technician will explain their safety, make the dose light and remain with them constantly for a few treatments. The usual dose of Tesla is 300 to 700 ma. for 10 to 15 minutes. It is usually best to increase the time rather than the amperage above these figures. If the patient holds the metal handle a pillow should be placed under it. If the wrists heat too much we should substitute for the handle a large block tin electrode in contact with the skin of the abdomen. We should guard against over dosage especially the d'Arsonval. The essayist has known anginal pains of serious import to follow rapid increase of d'Arsonval. The dosage of d'Arson-

val is determined by the patient's condition and tolerance and greater caution is required than in giving Tesla current.

Electro-Physiotherapy has survived and is gaining recognition at faster strides in spite of such abuses as its use by irregulars and cultists; its use by physicians and attendants untrained; its use in unsuitable cases; its use too prolonged in cases not responding; and last, but not least, the exploitation of inferior equipment.

In the Journal of the American Medical Association of October 16, 1926, is found a report of the Council on Physical Therapy of the American Medical Association from which the following is quoted: "Physical therapy came into its legitimate place in medicine during the World War. Today it is gradually taking its place with the usual medical and surgical procedures." "Physical therapy must be recognized as a definite part of medicine, practiced and controlled by graduate physicians. It should be used only as one of the triad of medicine, surgery and physical therapy." The ultra violet ray, both air cooled and water cooled, and diathermy are named in their endorsement. That puts legitimate physiotherapy on an equal footing with drug therapy so far as the authority of the American Medical Association is concerned. This council is composed of ten eminent men, among whom are Granger, Bovie and Cannon, of Harvard; Howell, of Johns Hopkins; Desjardins, of the Mayo Clinic; and Warthin, of University of Michigan.

The following illustrative cases are cited: Mr. B—, aged 56 years, consulted the essayist following a cerebral hemorrhage. He had partial paralysis, both motor and sensory, involving the right hand and leg. The history and examination showed that for some years he had suffered from renal calculi, pyelo-nephritis, and he had already developed diabetes mellitus. He had cardiac hypertrophy with definite arteriosclerosis and his blood pressure averaged 180-95. Early after treatment was begun he had a sec-

ond cerebral hemorrhage. He was confined to his bed for a few weeks and his partial paralysis did not entirely clear up as he had a slight limp and his hand showed slight permanent disability. Did I expect to cure him? Certainly not. Then why did I treat him? Because it was my duty to attempt giving him the best the profession had to offer. He was a very useful man to society, and essential to his large family, which he generously supported from his high salary. He was given Tesla along with other treatment. D'Arsonval was not in use much then. He lived nine and one-half years and was well enough to enjoy life most of that time; to perform his work practically all the time, and draw his salary full time. D'Arsonval would probably have given a better result. He died of his original diseases following a third cerebral hemorrhage.

Case No. 2: Widow, aged 53 years, complained of palpitation, aching at apex of heart, occipital pain, and chronic constipation. Pulse was 96 and blood pressure 182-96. The urine was pale, of low specific gravity, and showed considerable albumen and a few epithelial casts at times. The fluoroscope showed the heart and

aorta widened 35 per cent. There was no cardiac murmur. Diagnosis: Cardio-renal disease with hypertension and colonic stasis. She was given Tesla auto-condensation and later D'Arsonval. Within six weeks the urine was free of albumen and casts and the blood pressure averaged 135-80. Treatments were given less frequently for several months and there had been no relapse in her symptoms at last examination, eight months after treatment was begun.

#### CONCLUSIONS

1. Auto-condensation is worth while in a large percentage of high pressure cases if properly selected.
2. Auto-condensation may be expected to gain adherents as the former abuses diminish.
3. The best results cannot be obtained without strict adherence to the finest details of technique.
4. Physical therapy is in a transition stage and is becoming established on a scientific basis.

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## THE ULTRA VIOLET RAY IN DENTISTRY\*

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### PRODUCTION

It is not my desire to discuss the ultra violet ray at length, but I do feel that a very brief summary of its production and its position in the solar spectrum is necessary, especially for those who have not read extensively on the subject. The physiologic action of the different bands of the spectrum on the human body is well known to science. All light waves, visible and invisible, (except lightning and radio waves) possess a therapeutic value. Light as a therapeutic agency has been used for many centuries, but within the last twenty years considerable research has been carried on to determine the specific action of the different bands of the spectrum. The sun rays are composed of 80 per cent infra red rays (or heat rays), 13 per cent of visible light, and 7 per cent of ultra violet. It is now known that the invisible infra red rays will penetrate deeply into the tissues of the body and produce a hyperemia; that the visible red rays are stimulative; that the indigo, blue and violet rays are sedative; that the ultra violet rays are bactericidal and that the x rays and gamma rays destroy tissue. Inasmuch as we know the properties of each band of the spectrum, and have instruments to produce the respective bands, it is merely a matter of selecting the proper one to treat the pathology in hand.

You are interested in learning something of the properties of ultra violet and its action on the body. The so-called violet ray, which is being advertised extensively as a cure for almost every ailment, should not be confounded with the ultra violet ray. The violet ray is really

not a ray at all, but simply a high frequency discharge in the form of sparks administered to the body through a glass vacuum electrode. The action of the violet rays, or high frequency discharge, produces a slight hyperemia on the body. The color produced in the glass vacuum electrode indicates the degree of vacuum. If the vacuum is extremely low, the color is violet; if it is medium, the color is a light blue, and if it is high, the color is a light blue mixed with green. Ultra violet rays cannot be generated in a glass vacuum electrode. In fact ultra violet rays will not pass through even the thinnest piece of glass, because they are absorbed by glass. The generation of ultra violet is a matter of temperature. To conveniently generate it, mercury, quartz tubing, tungsten wire and electricity are used. The average temperature should be around 2,000 degrees Fahrenheit. It is essential that clear quartz tubing should be used for the reason that it will permit the passage of ultra violet rays and will stand a high temperature without breaking. The generation of the different ultra violet wave lengths is a matter of wattage.

The water-cooled burner, as used in dentistry, generates a large percentage of short bactericidal rays, while the air-cooled burner generates a large percentage of long metabolic rays. The shape of the burner, the terminals, and the degree of vacuum, are important factors in the production of the quality and quantity of ultra violet energy. The proper quartz burners are so shaped as to permit the passage of nearly all the ultra violet rays that are generated.

Generally speaking, in the application of ultra violet energy in exposures with the water-cooled, mercury vapor lamp of the modern type, exposures range from a minimum of twenty to

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thirty seconds, and seldom if ever exceed one minute. When using the ultra violet speculum, never exceed thirty seconds at the first application, and increase gradually at each sitting at the rate of ten seconds according to the tolerance of the patient. The time exposure must be measured accurately, otherwise unpleasant results will ensue. A reliable time piece of any sort will answer the purpose, but the interval timer, made especially for such work, is more dependable and should be used.

It is reasonable to expect, within a short time, that improved burners and lenses will be on the market whereby the exposure time can be cut down to a few seconds. A year ago we were using two to four minute exposures for the same reactions we are now getting at thirty seconds.

#### APPLICATION IN ORAL LESIONS

The great problem that seems to confront both the physician and dentist today is, shall or shall not a certain tooth or teeth be sacrificed to clear up some systemic ailment. We have all had the experience of seeing a bad case of rheumatism clear up following the extraction of a single tooth and on the other hand we have seen a rheumatic patient sacrifice all of his teeth and still his rheumatism continued without a let up. It has always been my desire to work with the physician when the general health of the patient is involved but we do feel that there are far too many teeth being sacrificed needlessly. However, many of our authorities tell us that a tooth with its pulp removed is a menace to health, even though there is no evidence of pathology either clinically or radiographically. This has not been proven to the satisfaction of less radical operators. It seems only fair to our patients and to ourselves that we use sane judgment in our efforts. To be radical either way is detrimental to all. While teeth are not a necessity to life of the human animal, teeth are essential and few operators appreciate the embarrassment and nerve rack-

ing ordeal that confronts the patient through loss of his teeth, especially teeth in the anterior region of the mouth. This is especially true of younger patients. It's a small matter to remove one or more teeth from the anterior region of a lady's mouth but to replace them to the satisfaction of the patient is a mighty big job.

If a physician has examined the patient thoroughly (by this we mean blood tests, diet, urine analysis and general physical diagnosis) and does not find a cause for some particular ailment, he, the dentist, must work in close co-operation with the physician and their mode for treatment must be very carefully selected. To our minds the proper way to determine a mode of treatment is, to place yourself in the patient's position and with your knowledge, treat the patient just the same as you would treat yourself.

As we have said before it has not been satisfactorily proven that all pulpless teeth are a menace, therefore, we have treated and will continue to treat pulpless teeth when we feel that it is not detrimental to the health of the patient, because we are sure, so far as we have been able to determine that pathology does not exist after an abscess cavity has filled in with new bone formation, a condition that actually takes place as we will demonstrate with the x ray slides that will be shown later. This is also true of some pyorrhetic conditions, especially in patients not yet of middle age. We are placing too much weight upon the shadows seen in x ray. "The dental x ray film is today in reality at the bottom of all the discussion on oral pathology. The importance of the findings pictured on the dental film cannot be over-rated. Their significance however, is often over estimated."

Before a patient is instructed to have all pulpless teeth removed it should be proven by the medical profession that such teeth are an

absolute cause of some secondary trouble. The procedure of elimination without due consideration is folly. The present trend towards higher education in our dental schools is a step forward and when we arrive at the time that medicine and dentistry are on a par we will all come into our own in the treatment of dental lesions.

#### *Abscesses*

In the treatment of abscesses, the ultra violet rays play a great part. They are not only a sterilizing agent but they prove to be one of the most helpful factors in the regeneration of bone processes, both periapical and periodental lesions. We have to consider two types, namely the acute abscess, and the chronic abscess.

*Treatment of Acute Abscesses*—In treatment of the acute abscess the first result found following an exposure is the relief of pain. The second result is regeneration of the bone process even in cases which had been considered hopeless before we knew of the application of the ultra violet rays.

The routine procedure followed is: localisation of the abscess cavity and its extent by x ray, status of the tooth or teeth in connection with the lesion, and surgical intervention.

*Treatment of Apical Abscesses*—In treatment of an apical abscess establish drainage, clean out root canal, insert a dressing of phenol on a cotton or paper point, and allow this dressing to remain for twenty-four to forty-eight hours. Then fill root canal with eucha-percha; after the canal has been filled, x ray checking is made.

At each sitting, during this surgical procedure, the ultra violet is applied directly over the abscess cavity. The site of the lesion is the factor which dictates the nature of the applicator to be used.

*Periodental Abscesses*—Periodental abscesses, which seem to be the most distressing to the

practitioner when they occur in the incisal region, have been successfully treated by the use of the ultra violet rays, in addition to proper surgical intervention. No special drugs have been used by us, except for a mild antiseptic (2% Mercurochrome) which was inserted into the lesion following exposure. The same selection of applicators has been used in these cases as for acute types. The time exposures and the reactive processes are identical.

*Chronic Abscesses*—The chronic abscess presents itself under two phases, with or without fistula.

*Chronic abscess without fistula*—In these cases the presence of the abscess will be revealed by the x ray. The extent of the lesion is of utmost importance, the status of the tooth or teeth in connection with it being the basis of our mode of treatment.

First—The canals are thoroughly calcified.

Second—The canals are partially calcified.

In the first instance it has not been our routine to try to establish any drainage, the abscessed cavity being fairly well walled off, preventing any further bacterial invasion along the alveolar process. The exposure to ultra violet rays is made directly over the abscess. The time exposure in these cases has to be lengthened to a certain extent, because we are dealing with an organized lesion, an average exposure being forty seconds to one minute.

In the second instance, where the canals are not entirely calcified, fill root canal by the usual routine procedure, being careful, however, not to over-use instrumentation and thus avoid producing an acute condition of a chronic one.

*Chronic Abscess With Fistula*—In the treatment of chronic abscess with fistula we have to

consider two things: The treatment of the tooth itself, and the treatment of the fistulous opening. Considering the tooth itself the treatment is similar to the one previously given. The ultra violet rays are applied with single point application over the fistulous opening. The exposure has to be of desquamative type (average forty seconds). No other exposure is made until the fistulous opening is closed; generally two to four exposures will bring about healing of the soft tissues. It is only then that exposure of the abscess cavity both lingually and buccally or palatally is made. In chronic abscesses the duration of treatment is usually four exposures each of forty seconds duration.

*Prognosis in Abscessed Conditions*—It seems hard to advise definitely which cases are treatable with chances of success, the prognosis depending greatly upon the general condition of the patient. The extent of the lesion is, of course, an important factor. However, we have seen extensive lesions respond very well to the application of ultra violet rays, when the above mentioned procedure was followed. It does not seem advisable to treat lesions where there is a loss of the entire supporting bone structure. However, in cases where we find absorption of one of the plates of the alveolar process, the prognosis seems to be favorable, but the treatment will have to be prolonged.

*Post-operative Period*—The post-operative period following treatment, of course, of abscesses either the acute or chronic type will base itself on the extent of the lesion treated and the type of the patient. These two factors should be given thorough consideration. Extensive lesions will heal less quickly than non-extensive ones. Patients without any systemic involvement prove better risks than those physically below par. As a rule we expect bone regeneration in favorable cases after a lapse of two months. Subsequent x ray examinations are advisable over a period of a year.

#### *Pyorrhea*

What is pyorrhea? We don't know. Has it been cured? We don't know. But we do know that we have helped extensive cases and that the active life of the oral cavity has been prolonged, and that many cases have shown no signs of recurrence over a period of years. Pyorrhea, like cancer, comes to us usually when the case is advanced to the hopeless stage. Physicians as well as dentists should be able to recognize pyorrhea in its incipient stage to avoid disastrous advanced cases. We as dentists believe that secondary lesions are caused more often from apical abscesses than from pyorrhea. Our treatment of pyorrhea is as follows: Scale all teeth involved to full depth of pocket to remove all debris, and establish drainage. (Scale once only. Continued instrumental intervention keeps the gums in a high state of irritation). Then apply the ultra violet rays between each tooth; upon the gum lingually and buccally or labially. These applications are made under pressure through a quartz rod to bring about dehematization, and are of one minute duration in each position and are applied to one half of either dental arch at each sitting. Our sittings are usually twice weekly. A period of four weeks being necessary to cover all of the arches twice. As yet we have not used medications of any nature, except a mild mouth wash, such as bicarbonate and water to allay any discomfort following treatment.

#### *Stomatitis*

We have classified stomatitis under three heads:

First, Traumatic, due to mal-occlusion, poor dentistry, etc. Ultra violet is of little value until the cause has been corrected. Then ultra violet applications will bring the hypotonic tissues back to normal by its stimulating action.

Second, Systemic due to diabetes, gravidic, professional stomatitis, and anti-syphilitic treat-

ments. Our prognosis in these conditions is not favorable with light treatment alone; however, local manifestations are greatly benefited in conjunctions with general treatment.

Third, infectious type due to vincent's infections, noma, mixed infections, etc. These forms of stomatitis respond very readily to ultra violet treatment and with a minimum of discomfort to the patient. Ultra violet rays are applied to these lesions through the ultra violet speculum, length of exposure being from thirty to sixty seconds according to the severity of the case.

#### POST OPERATIVE TREATMENT

Following minor surgery done at the chair, we have established as a routine the use of ultra violet first, to relieve pain; second, to overcome trismus; third, to prevent postoperative infection.

#### TRIFACIAL NEURALGIA

Trifacial neuralgia is the test par excellence as to the analgesic power of the ultra violet rays. When we stop to think over the so many complaints we encounter in our daily practice, I cannot recall a more distressing history than one of trifacial neuralgia. Witness once an attack of this pain and the conclusion will be "relief" at any cost.

I do not want to state here that by the application of ultra violet rays one will be able to eradicate the trouble and bring about a permanent cure and thus produce a miracle, but we have found results in following this technique: Preliminaries as usual, history of pain, its type (major or minor) and duration, general history of the patient. We all know, when we are dealing with women, especially, that the underlying cause of such lesions is not always local. Then, a thorough local examination, clinically and by x ray plates. When our diagnosis is made, our treatment may start in accordance. As in other

lesions, to establish a permanent cure the cause must be found and eliminated.

#### ANTRUM INVOLVEMENTS

In some cases of antrum infections, favorable results may be obtained by the help of the ultra violet light. The diagnosis is of the utmost infectious type. It has been our routine to be portance and the lesion presented must be of the sure to rule out any systemic sources predisposing to antrum complications, local source of infection must, of course, be ascertained, x ray examination is absolutely necessary to insure proper procedure.

The use of ultra violet rays in atrum involvements does not present a large scope, but is an adjunct to our therapeutic procedure as now established. We found it of great help as a palliative agent to pain, and as a bactericidal agent. Heat by means of diathermia may also be applied in conjunction with ultra violet radiations to promote absorption.

#### REGENERATION OF ALVEOLAR STRUCTURES

Regeneration intrinsically means normal new growth; where there is a degeneration there is a pathological condition. Logically speaking, the eradication of the pathological process should allow normal growth, but practice does not second the theory, and this mainly when we deal with the oral cavity.

There are two phases to consider in the regeneration of tissues in the oral cavity:

Hard tissue regeneration or bone.

Soft tissue regeneration or mucous membranes.

These considerations here deal solely with minor types of pathological processes. They leave out the more extensive ones of oral surgery. It has been my experience to notice that the hard structures will answer more readily and

show more tendency to regenerate than the soft structures.

In cases of abscesses where we deal with hard tissues only, the regeneration was nearly always complete, and after a lapse of two years, cases treated have not shown any recurrence. An average of two months has to be allowed between the last treatment and a final x ray checking. It is advisable to follow the condition of the lesion during that lapse of time. Roentgenograms taken once or twice will readily show us any improvement. The new formation of bone will appear at the periphery of the abscessed cavity as a line irregular in outline, converging towards the center.

In cases of pyorrhea, where the patient expects a regeneration of soft tissues as well as hard tissues, the result did not appear so gratifying. Did we expect too much to satisfy our own scientific point of view, or did we follow the psychic of the patient who expected the return to a normal condition?

Considering the regeneration as a whole the clinical findings even in extreme cases have always revealed a tightening of previous loose teeth, and stop of pus formation.

**Hard Tissues**—Checking of hard tissue by x ray was done following an average of two months after treatment, and has always shown a tendency in new bone deposit. It would be untrue to state that complete regeneration of the alveolar process occurred in every case. However, with patients free from any systemic involvement, regeneration appeared to be complete.

**Soft Tissue**—Soft tissues or mucous membranes are hard to regenerate when their regeneration follows an incipient cause such as pyorrhea. Where pus-forming bacteria brought about the degenerative changes, regeneration will be small.

Pyorrhetic pockets or recession of the gingival margin of the gum following traumatic interference for a number of years, have always responded to our expectations and the patient's. It will be easy to notice that in regeneration of the gingival gum tissue, the interdental papillae will show more tendency to push its way to normal position than the tissues around the neck of the teeth at the cemento-enamel junction.

#### ORTHODONTIA

The field of orthodontia with its various problems of cause and treatment has been greatly enriched in the past years. The work of Robin opened a new door as to the basic cause and the far reaching effect of mal-occlusion on the physical development and the general health of children. To say that these children offer a general hypotonicity of the system would not be far fetched. The work of Rogers in the application of muscular exercises as a help in the treatment of mal-occlusion is proof that the superficial muscles in their lack of tonus give way in front of the internal musculature of the oral cavity.

That mal-occlusion is a distrophy due to a general condition as a basic cause is my belief. One of the most important functions manifested at childbirth is respiration, and the dento-facial distrophy has a direct bearing on the respiration, also the dento-facial distrophy has a direct bearing on the respiratory apparatus, a sequel of the insufficiency of the air passages. There is no normal equilibrium between function, morphology and medium. The morphological alteration brings about not only physical troubles but psychic ones.

This early impairment of respiration brings about, over a period of years, a sluggishness of the vascular system, thus causing an unbalanced metabolic process in the body. This process can be raised—it ought to be raised; this is the point where the orthodontist, dentist and pediatrician must work in conjunction.

We have considered two successive phases in the treatment of orthodontia and the help given by physiotherapy. The technique given in the following lines seems to obtain hopeful results.

In early childhood, or pre-eruptive period, the work has to be done in close collaboration with the pediatrician and the parents for elimination of any possible injurious agent or habit.

The period during temporary dentition, at the start and at the period of exfoliation, seems to be the most critical in a child's life. Any break in the metabolic balance will have a great repercussion on the initial formation to appear years later. The long bones of the body, however, are given greater care than the oral cavity development.

In extensive dystrophy of the face, when the disease starts to be an atrophy, great help seems to be given by the application of ultra violet, for in such cases a great amount of hypo-tonicity is encountered. If we do not help at the base of the metabolic process, the actual treatment is trying for the patient and doctor, and often leads us only half way.

#### IN THE PRE-ERUPTIVE PERIOD

The use of ultra violet in this period seems to be most critical to the operator. I want to emphasize the point of diagnosis. We must ascertain whether ultra violet should be applied locally or generally over the entire body. In cases where we wish to apply ultra violet locally, a tonic dose is given, using the ultra violet speculum to secure a radiation of both maxillae and mandible, with a minimum time factor. The exposure time cannot be given accurately as children react differently to the same amount

of exposure. However, the operator may bear in mind that blondes react more readily than brunettes. The exposure is generally cut to fifteen seconds, as we have to avoid great reactions, including a desquamative erythema. It is far better to prolong the treatment and bring a gradual tonicity to the part.

#### DURING TEMPORARY DENTITION

Applications of ultra violet rays will be beneficial when normal exfoliation of temporary teeth and eruption of permanent ones is retarded or checked. Here again a judicious diagnosis on the part of the doctor is the most important step. In these cases we want a stimulation of the bone forming elements, i. e., calcium and phosphorus. The degree of stimulation has to be in parallelism with the force delivered by the prosthetic appliance, and the help given by the ultra violet rays in concordance with the physiological process going on.

These local applications are needed chiefly in children who had active rickets or tendencies to the disease in early childhood.

In severe cases of mal-occlusion, where the patient presents what Robin calls the "attitude reflex"—infantilism of the skeleton, narrowing of the nose, dull aspect of the eyes—the stupid look of children who keep their mouths open, general radiations of the body along with local applications seem to be of inestimable value. Such cases might be considered as pseudo-adenoid cases. They give the clinical appearance of patients with cyanosed hands, lordosis and low activity. Some are helped by the ablation of vegetable growth in the naso-pharyngeal region, but stop half way if their dento-facial dystrophy is not corrected.

# EDITORIAL

## ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

A Journal of Ideas and Ideals.

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Chicago, Illinois

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### PHOTOACTIVITY OF CERTAIN OILS

Coincident with the important investigations being conducted in this country are the ones carried out abroad, and, in particular the re-

searches of Eigel Rekling, who is attached to the personnel of the laboratory of the Finsen Institute, Copenhagen, the chief of which is Carle Sonne. Eigel Rekling's work on the photoactivity of certain oils is a valuable contribution to the already prevalent information on this subject, facts which have been given out by zealous investigators who are intensely enwrapped in the problem. For, not so long ago, Hess and Steenbock, with their respective collaborators, succeeded in imparting to certain vegetable oils and other substances—by the means of ultra violet irradiation—an anti-rachitic potency with respect to rats on a rickets-producing diet, where those same substances, non-irradiated, either did not possess that potency at all, or else in a very much slighter degree. The substances with which the investigations were undertaken were: linseed oil, cotton seed oil, cholesterol, phytosterol, lettuce, wheat flour, dried milk and spinach. In the non-saponifiable parts of the codliver oil and of the various oils that had been subjected to ultra violet irradiation, the anti-rachitic potency was found to have become strongly accentuated. Subsequent to ingestion, of the substances named, after these had been subjected to irradiation, the phosphorous content in the blood of the animals thus treated was found to be considerably higher than in the rachitic animals that had been given only non-irradiated substances. Hess, Weinstock and Hellman believe that the effect of the ultra violet light bath must be ascribed to its action on the cholesterol contained in the skin.

The purpose of Rekling's present contribution, as he puts it, is to investigate whether

there exists any difference between the photographic properties of the codliver oil and those of vegetable oils, in order to find, by the established proof of such a difference, a working hypothesis which would explain the spontaneous anti-rachitic effect of the former, as opposed to the corresponding effect of the latter, which is only acquired as a result of ultra violet irradiation. In addition to this, the work of the author has embraced an investigation of the conditions determining the acquisition, by the ultra violet-irradiated oils, of the photographic properties found in them; he has endeavored to identify the nature of those properties, and he has tried to solve the question whether the anti-rachitic effect of those oils is really due to their photoactivity or not.

Needless to say, the problem was not simple, nor was it solved in a short space of time. The author's descriptions of his experiments are fascinating, yet easily followed and therefore eagerly read. In order to give even briefly the final results of the investigations, no shorter resume could be written than that of the author himself. And because of the timeliness of this most important subject, the entire summary is here quoted:

"Comparative investigation concerning the photoactivity of respectively codliver, linseed, and olive oil shows that the first-named, in contrast to the two others, always impresses the photographic plate. Also that codliver oil, when left to stand for a certain length of time in complete darkness or in semi-obscurity, develops a respectively medium strong and very intense plate-darkening power, while under similar conditions the linseed oil develops respectively none or only a very slight one, and the olive oil does not become photoactive at all. Ultra violet irradiation, under identical conditions of dose and distance, of the three oils in identical quantities and presenting the same extent of surface, produces a much stronger photoactivity in the codliver oil than in any of the two others. From the vegetable oils the photographic agent can

again be removed completely by forcing air through the oil; from the codliver oil the same process will only remove it partially. If the ultra violet irradiation has been lengthy, the air-forcing process will not destroy the photoactivity. Codliver oil demands less additional ultra violet irradiation in order to retain its full amount of photoactivity. Ultra violet irradiation in an atmosphere of either nitrogen, carbon dioxide or hydrogen will not make the oils photoactive, or at least only slightly so. The presence of oxygen during the irradiation is a necessary condition for the genesis of photoactivity in the oils. The photographic agent can be transferred to a fresh oil from an already photoactive one by having a current of air from the latter pass through it. The fresh oil will then become photoactive in its turn, and will resemble hydrogen peroxide 1: in its ability to react photographically through paper and through membranes of either collodium or gelatin, but not through either glass, quartz, mica or paraffin; 2: in the fact that there takes place an after-ripening of the plate that has been exposed to the photo agent present in the oil and that, within certain limits of time, that plate itself will possess a degree of photoactivity in regard to fresh plates; and 3: in the fact that substances capable of splitting up hydrogen peroxide will have a destructive effect on the photographic agent. There is no ionization in connection with the photoactivity of the oils. The presence of hydrogen peroxide has been proved by means of Schoenbein's and Richardson's reactions. The photoactivity of the substances in question must, under those circumstances, be taken to be due chiefly to the formation of this hydrogen peroxide, in the oils, in the course of the oxidative (drying) processes in the latter; and, furthermore, the oils can be photoactivated by the process of sending through them air that has been made to pass across an hydrogen peroxide solution. — Experiments undertaken with rats on a rickets-producing diet did not reveal any seeming parallelism between the photoactivity and anti-rachitic potency in the oils. If we use the pho-

toactivity of the oils as an indicator for measuring the degree of their reaction to those factors — ultra violet irradiation and daylight — that catalyze the drying process, it would seem that the codliver oil is a substance which is in continual, strong activity, and which reacts to those factors far more easily than does either linseed or olive oil. It lies near, then, to suppose that the codliver oil contains some light-sensitive catalyst or photodynamic substance in which also ordinary daylight more easily sets going anti-rachitic processes, and that the lack of some such optical sensitizer may possibly account for the genesis of rickets in the organism of the child.

A. R. H.

#### PHYSICAL THERAPEUTICS ITS DEVELOPMENT DURING THE PAST DECADE\*

Physical methods were used in the treatment of disease from the beginning of medical history. The therapeutic value of heat and hydrotherapy were undoubtedly known to Hippocrates and others of his time.

During the dark ages, when it seemed as if all the progress which civilization had made since its beginnings was being swept away, the healing art fared no better than other branches of human knowledge. The world fell into deplorable superstition; bathing even for personal cleanliness was largely abandoned; and the pestilences resulting from filth and ignorance were laid at the door of long-suffering Diety.

With the coming of the Renaissance, early in the sixteenth century, many great thinkers arose in the fields of physics, chemistry and general philosophy. These laid a number of important foundations. The nineteenth century, with its epoch-making discoveries in biology, bacteriology and other fields, gave birth to the science of medicine. But through all these years

\*Given at banquet fifth annual meeting, American College of Physical Therapy, Chicago, Oct., 1926.

of progress in other lines, physical therapy lay dormant awaiting the astounding developments in physics, and especially in electricity, which characterized the last decade of the nineteenth century and the first of the twentieth.

When most of us were in medical school, physical therapy was a joke. They did teach us to give Brand baths in typhoid, but electro-therapeutic apparatus consisted of small faradic or magnetoelectric machines. The whole subject was considered the domain of quacks and fakers and any physician who showed interest in it was looked upon with suspicion.

Some progress had been made prior to the World War, as is shown by the fact that the first edition of Neiswanger's textbook, published in 1898, contained less than 20,000 words and said nothing about x rays, high-frequency currents or heliotherapy; while the 19th edition, published in 1918, used over 100,000 words and included chapters in modern subjects. But that was eight years ago!

The battle fields of France returned to our shores hundreds of men who had been horribly mangled by shrapnel, high-explosive shells and other missiles and who were suffering from extensive lesions of nerves, muscles and joints. Their rehabilitation was a pressing problem. With characteristic resourcefulness in the face of an emergency our medical men undertook the task. Treatment with drugs was, of course, out of the question; orthopedic surgery had very definite limits of usefulness; some of the newly developed apparatus for applying high-frequency currents, heat, light, balneotherapy and other physical agencies seemed to offer the only hope of benefit. Physicians in all the war-torn lands set to work to see what could be done. And so modern physical therapy was born—one of the few observable good fruits of the Great Conflict!

Another factor which has had a large influence in the recent development of physical ther-

apy was the modern discoveries in the field of endocrinology. We have only scratched the surface of this field, as yet, but the results, coupled with the general acceptance of the electronic structure of the atom, have opened vistas which only the boldest imagination dare explore.

It may be of interest to note that immediately after the war the physical methods in vogue were various forms of hydrotherapy, massage, passive movements, mechanical vibration and a few electrical agencies, such as galvanic and faradic stimulation and the sinusoidal current. The first time I ever saw an autocondensation couch was in 1919.

The fact that, from time immemorial, primitive peoples have more or less directly worshipped the sun, indicates that a vague knowledge of the beneficial effects of light is very old and very widespread. In 1886, Duclaux declared that sunlight was the best bactericide known; and ten years later Ward, d'Arsonval and Chauvin announced that it is the violet end of the spectrum that is most destructive. Early in the twentieth century Finsen and Rollier established their institutes of heliotherapy.

For some reason or other the Finsen lamp and others of the same type have never become widely popular in the United States, so that the extensive use of ultra violet irradiations in this country awaited the development of the quartz-mercury lamp. This apparatus has come into being during the last decade and has evolved rapidly from the earlier, rather crude machines.

The first sources of ultra violet energy were air-cooled and suitable for general irradiations only. Professor Kromayer's development of the water-cooled apparatus opened an entirely new field along this line, so that now the application of these rays to the various nooks and corners of the body waits only upon the production of quartz electrodes to transmit them.

Pacini has well remarked that the study of ultra violet energy is now entering upon the *quantitative* phase.

X rays were used for diagnosis in the latter part of the nineteenth century, and such use increased rapidly during the opening years of the twentieth. It is the last decade, however, which has seen the high development of the Coolidge tube, the Potter-Buckey diaphragm, the stereoscope and elaborate localizing apparatus, whereby roentgen diagnosis is being developed into a science.

The use of x rays in treatment, as well as the use of radium salts and emanations, has come about almost entirely within the past ten years.

The period between 1916 and 1926 has seen the use of mechanical vibration as a therapeutic measure diminish in popularity and the use of the sinusoidal or surging current increase somewhat. The static machine, for a number of years in more or less disfavor, seems to be returning to the field once more. Some progress has been made in the employment of galvanism, faradism, mechanotherapy, and hydrotherapy, but it has not been especially phenomenal. Infra red rays are still so new an agency that we are scarcely able, as yet, to evaluate them intelligently.

The use of heat in medicine is another very old idea, and the hot plate or flatiron was one of the standard household remedies of our grandfathers.

Late in the nineteenth century Tesla, d'Arsonval and others began to study high-frequency currents. This work was carried on by various students in Europe and in 1907, Nagelschmidt coined the term, diathermy, to describe the effects produced by these currents.

The wide use of diathermy has, however, been a development of the past decade. Its medical

application in a large variety of inflammatory conditions, including pneumonia, is now considered sound and conservative practice; and the researches of Crile regarding its use during and after operations give promise of some startling innovations in the field of general surgery.

While medical diathermy goes back to the early years of the twentieth century, surgical diathermy, it is a very recent addition to our armamentarium and its use in the treatment of accessible benign neoplasms and some varieties of malignant ones is rapidly gaining general acceptance.

As an indication of development in physical therapy which has taken place in the last ten years it may be of interest to note that the *Quarterly Cumulative Index* for the entire year, 1916, contained 13 articles under the three headings, "physiotherapy", "ultra violet" and "diathermy"; while the *first half* of the same publication for 1926 listed 101 articles under these three headings.

A cursory examination of the library of *Clinical Medicine* showed 27 books on various phases of physical therapy published prior to 1916 and 38 published since that date, with the list rapidly growing. A study of the catalogues of various publishers is still more impressive. Volumes published prior to 1916 number 53, while since that date 144 are listed.

The nineteenth century knew three medical journals which devoted some space to physical therapy, only one of which was of any importance. In 1913 and 1914 two journals dealing with radiology and radium therapy appeared. Since 1920, eight journals of national circulation, dealing exclusively with various forms of physical therapy, have come into the field, and their importance is growing rapidly.

This new specialty in medical practice has had such a phenomenal development in the past decade that there was danger that it might get out of hand. The quacks and charlatans who

had long had a monopoly on these forms of treatment have not been slow to capitalize their new dignity. The success of several large and reliable manufacturers of physical therapy apparatus has led a number of irresponsible concerns to launch hastily constructed machines or weird devices for using unheard of resources. Many well-meaning enthusiasts have undertaken the use of energies about which they knew little, upon human bodies about which they knew less, with the result that contradictory opinions have been rife.

The organization of the Council on Physical Therapy, of the American Medical Association, and the proposal of the Association of American Medical Colleges to introduce the systematic teaching of physical therapeutics into the curriculums of the various medical schools, bids fair to assure an orderly and systematic progress in this new branch of knowledge.

It may safely be said that, today, the various uses of ultra violet energy, the medical and surgical applications of diathermy and the use of the x ray and of radium are as well established therapeutic resources as any which are in general use, and are recognized as such by the most conservative members of the profession. Other physical agencies only await further demonstration to attain the same status.

But physical therapy is not an exclusive specialty. The last decade has seen its apparatus and its technics adopted by internists, surgeons, gynecologists, urologists, dermatologists, otorhinolaryngologists and other specialists.

The day is coming, if it is not already here, when every hospital and every physician's office will be considered incomplete if it is not equipped for the administration of the more generally recognized physical methods of treatment.

GEORGE B. LAKE, M. D., CHICAGO,  
Managing Editor *Clinical Medicine and Surgery*.

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# THE STUDENT'S LIBRARY

## BOOKS RECEIVED

This column is devoted to acknowledgment of the books received. Such acknowledgment must be regarded by the sender as sufficient recognition of the courtesy until time and space permit selections to be made for review.

**PRACTICE OF PHYSIOTHERAPY.** By *C. M. Sampson*, M. D., New York City, N. Y. Formerly in charge reconstruction U. S. Public Health Service Hospital No. 70, New York City. Pp. 602, 146 illustrations. St. Louis, Mo.: The C. V. Mosby Company, 1926.

**DISEASE PREVENTION.** By *H. H. Waite*, M. D., Professor of Bacteriology and Pathology, University of Nebraska. Pp. 623. New York: Thomas Y. Crowell Co., 1926.

**LESSONS ON MASSAGE.** Sixth edition By *Margaret D. Palmer*, (44, Gray Coat Gardens, Westminster, London); formerly masseuse and manager department of the London Hosp., and Instructor of Massage to the Nursing Staff. Pp. 306, 71 illustrations. New York: William Wood & Co.

**DISEASES OF THE RECTUM.** Second edition. By *Martin L. Bodkin*, M. D., Brooklyn, N. Y. Pp. 457, 111 illustrations. New York: E. B. Treat & Company.

**ELECTROTHERMIC METHODS IN NEOPLASTIC DISEASES.** By *J. Douglas Morgan*, B. A., M. D., formerly radiologist, Ross Pavilion, Royal Victoria Hospital, Montreal. Pp. 159, 36 illustrations. Philadelphia: F. A. Davis Company.

**PRACTICAL INDEX TO ELECTROTHERAPY.** By *Joseph E. G. Waddington*, M. D., C. M. Second edition. Pp. 356, 170 illustrations. Published by the Author, 110 Atkinson Ave., Detroit, Mich.

**THE HUMAN BODY.** By *Marie Carmichael Stopes*, Dr. of Science, London; Dr. of Phil., Munich; Fellow of Univ. College, London. Pp. 267, 53 illustrations and color plates. New York: G. P. Putnam's Sons.

**HIGH FREQUENCY PRACTICE.** Fourth edition. By *Burton Baker Grover*, M. D., Colorado Springs, Colo. Pp. 500, illustrated with engravings. Kansas City, Mo.: The Electron Press.

**HYDROGEN ION CONCENTRATION OF THE BLOOD IN HEALTH AND DISEASE.** By *J. Harold Austin*, Professor of Research Medicine, Univ. of Penn., and *Glenn E. Cullen*, Prof. Biochemistry, Vanderbilt University. Cloth. Pp. 62.

**A BIPOLAR THEORY OF LIVING PROCESSES.** By *George W. Crile*, M. D., Celvaland. Edited by *Amy F. Rowland*. Pp. 405. New York: The Macmillan Co., 1926.

**HUMAN PHYSIOLOGY.** By *John Thornton*, M. A. Third edition. Completely revised by *William A. M. Smart*, M. B., B. Sc., Lond.; *M. R. C. S., Eng.*; *L. R. C. P., Lond.*; department of Physiology, London Hospital Medical College, University of London. Cloth Price, \$3.75. Pp. 463, with 281 illustrations, some colored. New York: Longmans Green & Co., 1926.

**ATLAS ON DISEASES OF THE SKIN.** Part III. Atrophies, New Formations, Hypertrophies. By *Prof. G. Riehl* and *Prof. Leo V. Zumbusch*. Translated by *John B. Ludy*. Cloth. Price, three volumes, \$25.00. Philadelphia: Blakiston, 1925.

## BOOKS REVIEWED

**ATLAS OF DISEASES OF THE SKIN.** Part II, Inflammatory Diseases of the Skin. By *Prof. G. Riehl* and *Prof. Leo V. Zumbusch*. Translated by *John B. Ludy*, A. M., M. D., Col. Med. O. R. C., U. S. Army. Cloth. Price, three volumes, \$25.00. Philadelphia: P. Blakiston's Son & Co., 1925.

Translated from the original German, Dr. Ludy has improved upon the volumes by his addition of diagnostic and therapeutic notes. Reproduced in colors by photoengraving the illustrations are more lifelike. Bound in fabricoid with embossed titles, the set is a beautiful addition to the library.

The first volume depicted the infectious diseases of the skin. In the second volume the inflammatory diseases of the skin are shown. These include the various erythemas, dermatitis, purpura, urticaria, pemphigus, eczema, acne, lupus, psoriasis, lichen, herpes, etc. The second volume comprises 99 pages and contains 65 colored illustrations.

**SURGERY OF THE SPLEEN.** By *Eugene H. Pool*, M. D., Attending Surgeon, New York Hospital; Clinical Professor of Surgery, Columbia University, and *Ralph G. Stillman*, M. D., Clinical Pathologist, New York Hospital; Assistant Professor of Clinical Pathology, Cornell Medical School. Cloth. Pp. 347, with 72 illustrations. New York: D. Appleton, 1923.

Another of the Surgical Monographs published under the editorialship of Dean Lewis, Eugene H. Pool and Arthur W. Elting. American medical literature has in the past been conspicuous by its absence of monographic literature. The latter form has been that most used by and most valued from the European writers. This series of Appleton should serve as an appropriate introduction of such a form in American medicine.

The title for this monograph is misleading. Judging from the contents of the text, the title should not have alluded to surgery of the spleen any more than to medical questions arising. *The Spleen* would have been a much more appropriate head. The anatomy, physiology and general pathology is reviewed before referring to the physical and clinical examinations for normalcy and abnormalcy. The various alterations from the normal are considered separately. A classification of splenomegaly is given together with its association with diseases of the blood and other related conditions. A history of splenectomy is then given before spending twenty pages on operative procedures.

The subject is well reviewed and one may gain a great deal of information by reading this organized survey.

**THE HEART.** By *Dr. Selian Neuhof*, B. S., M. D., Visiting Physician, Central and Neurological Hospital; Consulting Cardiologist, Broad Street Hospital; Associate Attending Physician, Lebanon Hospital; Former Clinical Professor of Cardiology, Fordham University, New York. Cloth. Pp. 701 with 300 illustrations. Philadelphia: Blakiston's Son & co., 1923.

The recent advances made in cardiology resulting in the emanation of a great mass of cardiologic writings necessitates a volume such as this to evaluate and correlate the material given. To critically weigh the value of these newer contributions to cardiology, and to present this correlated material in such a manner as to be readily grasped by the general reader is no small task.

The writer begins in a logical manner. After presenting the embryological development and anatomical conditions of the heart, developmental anomalies are logically explained. The underlying physiology is reviewed. The cardio-inhibitory center working through the extrinsic nerves and in harmony with the myogenic and neurogenic impulses result in the rhythmic contractility and tonicity of the heart muscle. Cardiac histology and pathology determine the completion of the physiological response.

Before taking up the various pathological conditions of the heart, the etiology of heart disease is discussed and the various graphic and instrumental aids in making diagnoses and influencing treatments are detailed. The importance of history records and accurate physical examinations is emphasized. Subsequent chapters deal with the recognition of decompensation, rheumatic and bacterial endocarditis, cardiac syphilis, myocarditis, neuroses, congenital heart disease, drug and other therapy, precordial pains, blood pressure, sociological aspects of heart disease and the relation of the heart and circulation to other diseases and conditions.

For the practical analysis and diagnosis of the disease at the bedside, cardiovascular clinics in the form of case histories are given. Cases are grouped according to the existing condition. Treatment and the reason for the choice of drugs are given equal consideration.

By such a combination of theoretical and practical application this volume should prove a comprehensive, practical reference book for both practitioner and student, as well as for those especially interested in cardiovascular diseases.

**MEDICINE. An historical outline.** *M. G. Seelig*, M. D., Professor of Clinical Surgery in the Washington University School of Medicine. Cloth. Pp. 207. Baltimore: Williams & Wilkins Co., 1925.

It is the usual occurrence, almost a rule, that the history of medicine is a neglected part of the crammed medical curriculum. In our attempt to so thoroughly

and excitingly cover the entire field of medical science, numerous subdivisions are made of the one subject. In this haze of subdivision and specialization, the unity of the subject is so apt to be lost by the student. He is so intent upon obtaining the recognized facts and theories of today that he laboriously plunges through the fundamental principles outlined by our predecessors to obtain his goal. Little is he made to realize that which has preceded him. Seldom does he take the time to stop and wonder how such facts became established. The names of Pasteur, Koch, Ehrlich and possibly Lister sound familiar but an appreciation of Hippocrates, Aesculapius, Vesalius, Pare, Leeuwenhoek and so many others is wanting. We cannot dodge the facts; but suggest such an addition and it means one more load on the already overburdened shoulders.

The little text by Seelig solves such a problem. Written in a pleasing and fascinating style, this text of only two hundred pages covers the history of medicine in a brief yet comprehensive manner. It is well worth the time of every medical practitioner and student.

**PRACTICAL MATERIA MEDICA AND PRESCRIPTION WRITING.** *Oscar W. Bethea*, M. D., Ph. G., F. A. C. S., Professor of Clinical Therapeutics, Tulane School of Medicine; Professor of Therapeutics, Tulane Graduate School of Medicine; Chief of Medical Staff Southern Baptist Hospital, New Orleans, Formerly Professor of Chemistry and Professor of Pharmacology, Mississippi Medical College, etc. Cloth. Price \$4.50. Pp. 498 illustrated. Fourth revised edition. Philadelphia: F. A. Davis Co., 1925.

Our medical curriculum is crowded full of courses instructing students on the fundamental sciences of the body—anatomy, physiology, etc., supplemented with the two clinical years on the recognition and supposedly the treatment of disease, and we are justified in such an arrangement. Yet, that all influencing factor, the psychology of the patient is very often missed. Much of the success of the practitioner is not alone in his ability to recognize disease processes and know the treatment to be used. Much depends upon his handling of the patient, the method of preparation of his drugs and the general "medical attitude" so to speak. To diagnose a blood dyscrasia and know that iron is indicated yet to be unable to prescribe it in the most palatable, assimilable and convenient form, seriously handicaps one in the practice of medicine. We agree with the author that not only the knowledge of the drug indicated is necessary but also its form and method of preparation and administration is essential.

The author divides the text into three main parts. In the first portion, a resume of the various drugs are

given. The Latin name, synonym, and pharmacological properties (form, odor, taste, solubility, incompatibilities, and average dose) are enumerated. The therapeutic action, uses, toxicology, and administration precedes numerous illustrations in the form of prescriptions. The second portion handles the art and science of prescription writing. The short third portion illustrates common errors and corrections of prescription writing. Following these divisions there are two complete indices—one a clinical index, the other a pharmacological index.

Particularly for the student, especially the sophomore and junior, this text should be of great assistance. It contains much well worth the time of the average practitioner.

**AURICULAR FIBRILLATION.** By *J. G. Emanuel*, B. Sc., M. D., F. R. C. P., Physician to the Queen's Hospital, Birmingham, Consulting Physician to the Birmingham and Midland Free Hospital for Sick Children, Lecturer in Clinical Medicine, University of Birmingham. Cloth. Pp. 31 with 16 figures. Birmingham: Cornish Bros., 39 New Street, 1926.

The Inglesby lectures delivered at the University of Birmingham May 6th and 13th, 1925, constitute the foundation for this monograph.

The material has been divided into two parts. In the first portion the physiological activation and propagation of the impulse that causes the heart to contract is discussed. The alteration in the resulting rhythm and alteration in the heart activity follows. Particular attention is centered on the fibrillation of the auricles. The effect of cardiac exhaustion on the sinus rhythm and the various effects of disease processes, toxins both endogenous and exogenous, and the activity on an auricular fibrillation is given. It is a recognized fact auricular fibrillation does not occur in the normal heart. Apart from structural alteration in the heart, the result of acute rheumatism in the young, and arteriosclerosis after middle age, the author regards toxemia as a common cause of auricular fibrillation.

It is a condition that is not so readily diagnosed apart from such other cardiac irregularities as sinus arrhythmia, extra systole, partial or complete heart block, flutter, etc. The prognosis follows the symptomatology and precedes the treatment advocated. Digitalis is a palliative means of controlling the irregularity of quinidine sulphate the author has advocated as a follow-up drug. "For treatment of cardiac failure with auricular fibrillation, digitalis is a specific remedy and quinidine a valuable coadjutor."

# INTERNATIONAL ABSTRACTS

## Radiation Reaction of Metastatic Squamous Cell Carcinoma in Cervical Lymph Glands. Douglas Quick, M. D. (Tor.), F. A. C. S., and Max Xutler, M. D., Am. J. Roentgenol., December, 1925.

The purpose of this work was first, to study the effects of the various types and intensities of radiation upon metastatic squamous cell carcinoma in lymph nodes; second to study the mode of action of radiation causing tumor regression, and third, to study the reaction of the lymphoid tissue to varying types and intensities of radiation.

The material upon which this study is based was composed of 40 specimens of cervical lymph nodes, invaded by squamous cell carcinoma, which have been removed following surface irradiation.

A study of the character of the individual tumor cells revealed two distinct types: the adult fully differentiated squamous cell, and a transitional type of cell in which squamous characters are lacking. The former is radioresistant and its response to radiation depends upon the type and intensity of radiation employed. The latter is radiosensitive and responds favorably to smaller doses. Based upon these histological characteristics, a division of the cases into two groups was made.

Marked destructive effects upon squamous cell carcinoma were obtained by means of intensive radiation with combined high voltage roentgen rays and radium. Small doses of radiation either roentgen rays or radium alone, or a combination of both, were wholly inadequate in their effects upon the resistant type of tumor cell.

Small doses of radiation which had little or no effect upon the squamous cell were found to cause rapid and effective regression of the transitional type of tumor cell.

Gross pathological changes in the nodes have consisted of fibrosis and thickening of the capsule and a central necrosis.

Three distinct types of radiation regression were observed by the authors:

1. Massive central necrosis accompanied by little or no reaction in the adjacent tissues, the central necrosis may be due largely to spontaneous degeneration of the tumor.
2. A histological picture in which the favorable reaction in the tissues adjacent to the tumor is the outstanding feature, connective tissue stimulation, and rich cell and lymphocytic exudation, in which the radiation effect is diffuse and uniform throughout the tissues, and in which effective regression of the tumor is observed. This is the type of reaction associated with combined, intensive roentgen ray and radium emanation.
3. Rapid and massive liquefaction necrosis associated with a rich exudation of lymphocytes and plasma cells following radiation of the transitional type of tumor cell.

It was found that radiation regression of the tumor was most effective when associated with a favorable reaction in the adjacent tissues, and least effective when this reaction was missing.

Intensive radiation with repeated high voltage roentgen rays and radium has not injured the tissues adjacent to the tumor; on the contrary, a stimulating effect upon the tumor bed has been frequently observed.

Normal lymphoid tissue was observed to resist large doses of radiation. A peculiar lymphoid hyperplasia occurs, the nodes become enlarged, the lymph follicles prominent and the germinal centers contain numerous mitotic figures.

## A Study of the Activity of the Human Heart, Simultaneously Recorded by X Rays and Electrocardiogram, Nils G. Stenstrom and Nils Westermark. *Acta Radiol.*, 5:408-418, October, 1926.

The inductive disturbance caused by the x ray machinery in the string-galvanometer circuit has been

compensated by inducing in this an opposite induction current of the same period and strength. Following this principle the authors have succeeded in getting useful electrocardiograms during the x ray exposure.

The movements of different points of the outlines of the heart have been photographed through a slit on a falling plate, generally two points at the same time, and then the curves have been compared with the electrocardiograms obtained simultaneously.

The authors give a preliminary report of the results with their technique:

The curves are probably caused by contraction of the border and also pushing and traction from other parts of the heart. The curves from the upper and back part of the right border are most probably caused by the ventricle pushing the auricle to the right.

Different points of the border of the heart show different curves. Each point has its own characteristic curve.

The interval between the electrocardiogram and the chief summit of the x ray curve is for a certain point constant but it changes from point to point. The minimum for this interval is found. One is on the right and the other in the left ventricle in the apex region.

**True and Pseudo Angina Pectoris: Diagnosis and Treatment.** William Martin, M. D., *Physical Therap.*, 44:477-484, Sept., 1926.

It is often difficult to clearly differentiate true from pseudo angina pectoris. In the latter condition, there is usually a history of a neuritic attack, a "rheumatic" attack, affecting the arm and shoulder or any part of the body. Here the question and search for foci of infection are important and when eradicated, the condition is frequently relieved. In the former condition, in true angina, the site of the pain is over the precordium, it radiating to the shoulder or down the arm. Its occurrence is not associated with rheumatism. There is no definite periodicity, and the attack is associated with signs and findings of hypertension.

Treatment for the true angina is both symptomatic and palliative. Symptomatic treatment includes the antispasmodics, nitroglycerine and amyl nitrite. The cardiac efficiency can be improved by the use of diathermy. For myocardial insufficiency, vibration will do much toward an improvement of this condition. In certain proportion of cases circulatory stasis, particularly hepatic, needs attention. Here diathermy is

directed over hepatic area, a current charge of from 1500 to 1800 milliamperes should be given for at least one half hour.

Frequently there is a combination of possible causes. In these cases, diathermy over the liver is first used followed by auto-condensation over the cardiac area. Usually only 400 to 500 milliamperes, using a thick dielectric, for about fifteen to twenty minutes according to the effect produced.

**Measurements by Means of the Siemens' Dosimeter and the Sabouraud Pastille, and by the Former in Connection with a Tube of Sabouraud Paper.** Paul Jacoby. *Acta Radiol.*, 5:333-371, Aug. 1926.

The present paper represents an attempt to surmount some of the difficulties, and answer some of the questions, with which the roentgen operator is faced whenever a substitution of a new and more powerful therapeutic apparatus, in the place of the old and feeble one with which he has hitherto been accustomed to work, obliges him to reestablish the entire scale of exposure times to fit the altered conditions.

The author's measurements were made by means of the Siemens' Dosimeter and the Sabouraud Pastille, and by means of the dosimeter in connection with a tube of platino-cyanide of barium, the latter being fitted over an ionization chamber.

An investigation as to the various respects on which the more powerful apparatus presents an advantage results in the conclusion that as regards the skin erythema dose, it means an enormous shortening of the exposure time; while, on the other hand, for voltage higher than 100 or 120 kilovolts its use does not result in any appreciable increase of the penetration percentage.

The limitations of the various measuring devices are discussed, and particularly that principal shortcoming, attaching to them all, that there is no means by which the indications for the different qualities of radiation can be compared. Especially is the Sabouraud Pastille and its alleged deficiencies gone into very exhaustively.

A chief objection to the pastille being based on the fact that at certain wave-lengths its own characteristic radiation causes it to colour too quickly the author was induced—particularly as the result of earlier investigations by Arntzen and Krebs—to make some further studies concerning the absorption in the pastille

itself. To this end he has measured, by means of the dosimeter, how much the intensity of the radiation became diminished when the ionisation chamber was entirely covered by a tube of Sabouraud Pastille paper. He has measured this absorption at increasing tensions of from 60 to 180 kilovolts, and also under various conditions of increased filtration at many different tensions; and he has found that there is a perfectly gradual decrease in the absorption following filtration with from 1 mm. Al to 8mm. Al and  $\frac{1}{2}$  mm. Cu + 1 mm. Al—the last-named composite corresponding to 11 or 12 mm. Al. He has, thus, been unable to find any break in the absorption which might be explained as due to the characteristic radiation.

It is taken for granted that the erythema dose is the resulting product of time  $\times$  intensity of radiation  $\times$  the percentage of radiation which is absorbed by the skin; and if it were possible to determine the value of each of those factors separately it would be possible to figure out the correct exposure time for a different quality of radiation. It is supposed that the absorption in the pastille paper tube, measured as just indicated, is parallel with the absorption in the skin, and that the ionisation current is an expression of the surface-intensity on the skin. On this basis it is tried, by means of a simple equation, to find the correct exposure time for 1 S. E. D. under various conditions of intensity of radiation. Practical tests, in which the exposure-times for 1 S. E. D. had previously been determined empirically, seem to prove the correctness of those theoretical conclusions.

Practical experiences concerning the erythema dose prove the latter to be somewhat different for different individuals; and it has been observed, also, that the reaction of the skin becomes unexpectedly strong under short-time exposure with higher intensity. These phenomena the author likewise attempts to account for.

Numerous measurements have been made by the author, both on water- and paraffin phantom, under all the different conditions of radiation employed at his clinic. Those measurements are recorded on home-made celluloid working charts, by means of which it is possible to establish exact plans for the dosage in each case.

**Some Suggestions Concerning the Use of Heliotherapy in Tuberculosis. Samuel H. Watson, M. D., Southwestern Med., 10:379-382, Sept., 1926.**

Heliotherapy is an old method of treatment that has recently become modernized. Its indications are numerous. Its applicability to tuberculosis has been

decisively demonstrated by Rollier, his findings and conclusions being presented in "Die Heliotherapie der Tuberkulose". The author offers some elementary rules that should be observed in the application of heliotherapy:

1. Always see that the patient protects his head, either keeping it in the shade or by wearing a broad-brimmed hat.
2. Always see that the patient wears dark glasses to protect his eyes. By dark glasses, colored lenses are not meant, but the plain shaded lenses calculated to cut off light rays must be employed.
3. Always see that the site of the disease is kept covered until such a time as lack of reaction and incipient pigmentation show that everything is progressing favorably.
4. Always see that the patient first exposes his feet and then proceeds towards the trunk.
5. Always see that the patient's body is protected from the cold wind; he must be kept comfortably warm.
6. Always, in all cases of pulmonary involvement, see that the chest is covered up until it is certain that the patient is improving; then, and then only, may the patient proceed to expose the parts hitherto protected.

#### CHART

#### CLASSIFICATION OF TUBERCULOSIS IN RELATION TO HELIOTHERAPY.

Note. The scheme which follows is offered as a working classification only; it is made solely with reference to heliotherapy, and except in this connection it has no necessary meaning or value.

TUBERCULOSIS	Extra-Pulmonary: (So called surgical) infections of external lymph glands, bones, joints, peritoneum, etc.	Without pulmonary lesion Class 1.
		With pulmonary lesion Class 2.
Pulmonary:	Pro- ductive	Childhood type (tracheo-bronchial glands) ....Class 3.
	Infections of lungs and tracheo-bron- chial glands	Adult type (lungs) ....Class 4
	Exudative	.....Class 5.

Class 1. Use sun in all cases.

Class 2. Use sun in all cases, but be careful to avoid reaction, and be especially careful in exposing the chest.

Class 3. Use sun in all cases.

Class 4. Use sun only in those cases which in spite of the best hygienic-dietetic treatment remain in a stationary condition or lose ground.

Class 5. Never use sun.

**The Ultra Violet Ray as a Prophylactic Against Radiodermatitis. George M. MacKee, M. D., and George C. Andrews, M. D., J. A. M. A., 85:1715-1720, Nov, 1925.**

Actinotherapy is of some value in the treatment of chronic ulcers and telangiectasis caused by roentgen rays or radium. Vigorous actinotherapy, resulting in acute erythema, at or near the time of roentgenization, may enhance the result of the latter. Tanning of the skin by actinotherapy does not materially increase tolerance for roentgen rays or radium. Preliminary, generalized actinotherapy, even when continued for a long time, does not appear materially to decrease "radiosensitivity".

It is possible to administer several or many times the standard erythema dose of roentgen rays to normal human skin without affecting more than a mild visible reaction. Ignorance of this fact may account for the erroneous assumption that actinotherapy is a prophylactic against roentgen ray and radium injuries.

It is the opinion of the authors that the ultra violet ray, regardless of how employed, is of no practical value against acute or chronic radiodermatitis.

It is the opinion of the authors that a combination of the ultra violet ray and the roentgen ray is more

likely to be followed by sequelae such as telangiectasia than when the roentgen ray alone is employed.

**The X Ray Treatment of Superficial Pyogenic Infections. Isaac Gerber, M. D., Rhode Island M. J. 9:33-38, March, 1926**

The application of x rays to superficial pyogenic infections has been known for many years, but the value of the method has not penetrated the general medical public until recently. The neglect of the treatment has been due partly to the old fear that x ray dermatitis was a sequel of roentgen treatment and partly to the excessive emphasis of recent years on the x ray therapy of malignancy.

The x ray treatment is applicable to cases of carbuncle, furuncle, paronychia, phlegmon with or without lymphangitis, cellulitis axillary abscess, erysipelas, etc.

Clinically the treatment is followed by very prompt lessening or disappearance of pain, diminution in the local edema and swelling, and gradual subsidence of the infection. If treated early enough, complete abortion of the disease may be obtained. Infectious processes of longer standing may be converted into one enormous abscess cavity which may perforate spontaneously, or may require a slight incision or puncture. In other types of infection, with the disappearance of the surface edema, one or more centers of localization may be produced, which also may perforate or may require surgical intervention. The effects of treatment are always better when the abscess remains closed before radiation.

The best explanation of the effects of the x ray is based upon the production of a local effect is due largely locally and generally is also important. The local effect is due largely to the action of the rays on the leucocytes, producing dissolution. The secondary production of antibodies locally and generally is also important.